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Modern Silver-Lead Smelting at Laurium, Greece

The Mines Supply a Self-Fluxing Mixture Carrying 11 Per Cent. Lead. Twelve Castilian Furnaces Supplanted by an American Blast Furnace

BY HENRY F. COLLINS*

The metallurgical treatment of the ores found in the mines of Laurium, including the smelting of lead ores, was briefly summarized by me in an article published in the JOURNAL, Feb. 23, 1905. Since the date of my visit, the comparatively low tenor of the ores in lead and the high volatilization losses always experienced with the old-fashioned Spanish type of blast furnace have induced the French Laurium Mines Company to radically reform its methods and modernize its smelting works.

The total quantity of material smelted annually at the works of the French company, is about 90,000 tons, of which from 7000 to 8000 tons are galena concentrates, carrying about 50 per cent. lead, the remainder being oxidized ores with an average of 10 to 11 per cent. lead and considerable amounts of zinc and alumina. From a metallurgical point of view the most favorable feature of the ores available is that they contain high proportions of the carbonates of lime and iron with some manganese, so that it is easy to obtain a self-fluxing mixture, barren flux never being required.

table is taken. The deposits of lead ore in the Camareza section of the district include both galena and oxidized ore, oxidized ore predominating. The gangue is generally calcareous or ferruginous—occasionally, however, silicious; the principal associated minerals are calcite, limonite, aragonite, selenite in very fine crystals, a little calamine, and occasionally small quantities of various copper minerals and the rare minerals, adamite, serpierite and buratite.

The ores of Souréza in the southern part of the district are chiefly galena (with some lead carbonate) and zinc carbonate, in a gangue of calcspar and fluorspar—sometimes as much as 30 per cent. of the latter—with very little iron or pyrite. An average composition for large masses of this ore would be 10 per cent. lead, 12 per cent. zinc and 15 per cent. iron, in the form of pyrite, in a gangue of quartz and calcite which is generally more or less mixed with chalybite and carbonates of manganese. The better grade of sulphide ore is smelted direct, but the zinky silicious and more pyritous sulphide ores are first concentrated.

The smelting furnaces were formerly of the old Spanish type, circular masonry furnaces, 4 ft. 6 in. in diameter provided with 4 water-cooled tuyeres, and furnished with blast at 6 to 7 oz. pressure; the column of charge extended at most only 9 ft. above the tuyere level. There were 12 of these furnaces and each

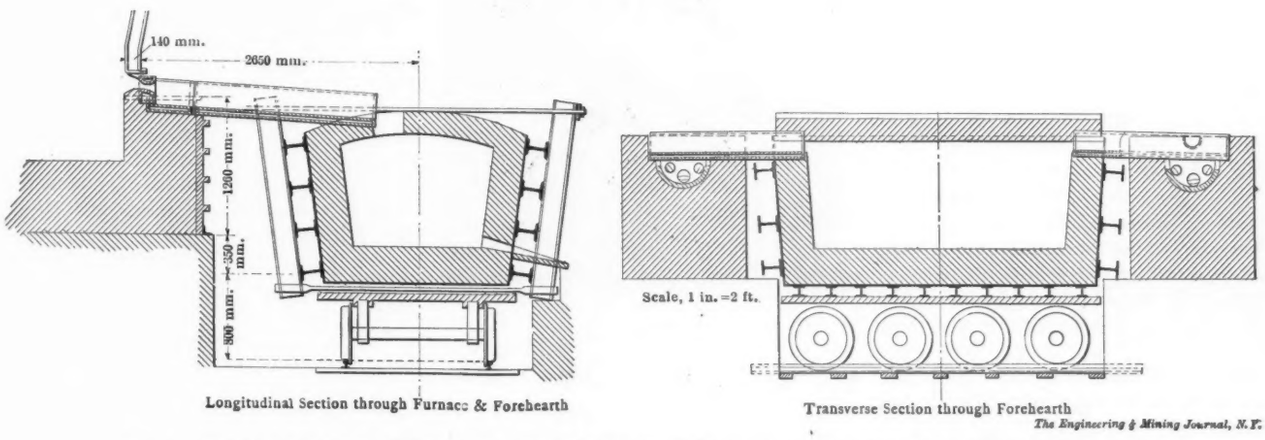

FIG. 1. SECTIONS THROUGH FOREHEARTH AND FURNACE OF FRENCH LAURIUM MINES COMPANY, LAURIUM, GREECE

VARIOUS ORES OF THE DISTRICT

Analyses of some of the principal ores of the Laurium district were published in my article in the JOURNAL, Nov. 10, 1904, from which the accompanying silica. In bulk they run about 10 to 12 per cent. lead, with an average of 10 oz. silver per ton. In view of the considerable percentage of galena, it is somewhat remarkable that the ores contain no blende, the 10 to 12 per cent. zinc present being all in the condition of carbonates.

In the Plaká portion of the Laurium district, both carbonate and sulphide ore are found together with manganese and manganiferous iron ore. The mixed sulphide ore resembles that of Leadville rather than that of Broken Hill, in that the proportion of iron pyrite is considerable. In some of the Plaká ore the carbonates of iron and manganese predominate over the quartz, while the galena is found practically free from blende and smelted about 25 tons of charge per day with a fuel consumption of 17 per cent. by weight of coke. The loss of lead by volatilization was 2 to 2½ per cent. of the charge, or from 20 to 25 per cent. of the total quantity of lead present. Owing to the low temperature of the smelting zone, the slow rate of smelting, and the high reduction, great trouble was experienced through accretions both in the hearths and in the shafts of these old-fashioned furnaces.

THE NEW BLAST FURNACE

The new furnace is of the American type, now standard for large installations all over the world, and handles from 250 to 300 metric tons per day. It measures

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ANALYSES OF LAURIUM ORES.

	Sourèza Carbonate Lead Ore.	Camareza Earthy Carbonate.	Camareza Calamine.		Plaká Heavy Sulphide.	Plaká Carbonate Gangue.	Plaká Calcined Manganiferous Iron Ore.
			1st Class	2d Class			
	Per Cent.	Per Cent.	Per Cent	Per Cent.	Per Cent.	Per Cent.	Per Cent.
SiO_2....	3.40	8.64	7.12	9.75	2.96	11.92	7.20
Fe.	2.16	20.91	5.54	15.00	27.22	37.30	37.10
Mn	2.25	5.69	1.08	0.40	0.58	4.47	14.33
Al_2O_3..	0.25	10.70	3.68	7.60	7.32	3.20	.....
CaO . ..	19.42	2.20	8.33	10.00	5.71	0.70	tr.
MgO ...	0.25	0.10	0.40	0.30	0.10	.....	.....
Zn	11.96	2.40	50.80	38.35	13.35	4.46	1.40
Pb	9.75	6.45	0.60	tr.	9.35	11.85	0.80
Cu	.....	0.08	0.01	0.05	0.02	.....	*nil*
Cd	.....	.....	0.18	0.07	.....	.....	.....
As.....	0.10	4.00	1.12	2.70	tr.	.....	*nil*
S	0.22	1.30	0.11	0.35	23.65	1.27	1.66
CaF_2...	25.96	*nil*	*nil*	0.06	.....	.....	.....
CO_2....	.....	16.00	.....	.....	.....	.....	.....
P	.....	.....	.....	.....	.....	.....	0.06
H_2O....	.....	.....	.....	.....	.....	.....	0.90
Ig.Loss	24.80	.....	.....	.....	.....	.....	.....
Ag.....	0.031	0.0152	.....	.....	0.0075	0.0185	.....

156x44 in. at the tuyeres and 20 ft. 4 in. from tuyere level to feed floor, and was built by the Colorado Iron Works Company, although certain important alterations in details have been made on the spot subsequent to the delivery of the furnace. Fig. 1 shows longitudinal and transverse sections of the forehearth, the former also showing part of the furnace. The crucible rests upon the usual sheet-steel bottom plate and is enclosed in mild steel plates with strengthening I-beams, the ribbed cast-iron plates supplied originally for the short ends of the curb having to be replaced almost immediately. The crucible is built as usual of firebrick, inside which is a lining of a special chrome-magnesia brick containing 3 parts of burnt magnesite to 1 part of chromite, this being necessary on account of the speiss made here rapidly corroding all ordinary firebrick, whether silicious or basic, having, however, but little effect on those made of the above mixture.

The water jackets are of mild steel plate 5/16 in. thick outside and on the fire side 7/16 in. thick. They are 7 ft. high, the water space measuring 4 in. in width. There are in all 8 side jackets and 2 end jackets; the two central side jackets on each side of the furnace are provided with 3 tuyeres and the two outer ones with 2 tuyeres each, making altogether 10 tuyeres on each side provided with convenient independent tuyere-valves. As at first sent the tuyere pipes were fastened into the jackets like boiler flues in the usual way, namely, by expanding against the orifice cut in the inner jacket plate and beading over the edges, but trouble was experienced from leakages, and recently welding the end of the tuyere pipe to the inner jacket plate by means of the oxy-acetylene blowpipe, has been adopted, an improvement which has resulted in the elimination of all leaks.

Fig. 2 shows side by side the inner plate of two jackets one of which has the tuyere pipes "beaded" in the usual way, the other having been welded by means of the oxy-acetylene blowpipe. Sea water is used for cooling and saline deposits are entirely avoided by circulating a quantity of water sufficient to keep the temperature of the effluent at or below 50 deg. Centigrade.

Structural Features

The brickwork forming the furnace shaft is supported on brick arches turned from abutments formed of L-shaped steel castings, bolted to the tops of four mild-steel columns and strengthened mutually by means of heavy tierods running both longitudinally and transversely. Upon these arches the shaft is built as usual of ordinary red brick with a one-brick lining of firebrick, the total thickness tapering from 3 ft. to 2 ft. 8 in. at the top.

FIG. 2. OLD AND NEW TUYERES

Above the feed floor, connection is made with a fixed hood and chimney supported from the roof of the furnace building by means of a movable charging hood running on wheels transversely to the longer axis of the furnace and provided with four counter-balanced doors on each side. These are opened by the side-dumping charge cars in the act of delivering their contents and close automatically. The ore charge is trammed in 8 small side-dumping cars holding 600 kg. each, or a total of 4800 kg., half of which is dumped from each side of the furnace. The coke charge of 624 kg. is trammed in 4 side-dumping cars of double the length of the ore cars so that each opens two of the furnace doors in the act of delivering its contents. Like the ore charge it is dumped simultaneously from both sides of the furnace. Doubling the weight of the charges has been tried but has not given satisfactory results, the amount of accretions appears to be increased and the working becomes irregular.

Blast is supplied by either of two Root's blowers, each of which can deliver 10,500 cu.ft. of air against a pressure of from 35 to 40 oz. The blast enters the furnace through 20 tuyeres, measuring 4½ in. in diameter but provided with thimbles of 3½ in. interior diameter; each tuyere has the usual Davis slag-escape and a separate brass tuyere valve. The blast-gate on the bustle-pipe is operated by means of a chain and a weighted safety-valve opens automatically as the gate-valve closes.

Continuous Slag Flow

Special attention may be directed to the arrangements for handling matte and slag, one interesting feature of which is the employment of a forehearth having a constant flow of slag without a trap spout. The whole of the molten products leave the furnace at one end through a tapping jacket, made of high-grade phosphor-bronze with 98 per cent. copper and the minimum aperture of which is 2¾ in. in diameter. Exactly opposite the center of this aperture a long water-cooled plug is held in glands hanging from fixed supports in such a way that it can be pushed in or drawn out at pleasure, thus restricting or enlarging the area of the annular ring left between its rounded point and the tapered hole in the tap-jacket through which the molten products of the furnace issue. The plug is a steel tube with rounded point made of wrought-copper. The details of its construction may be seen in Fig. 4.

By entering or withdrawing the plug, irregularities in the slag-flow caused by variations in the speed of smelting or in the pressure of blast are controlled with great exactitude, so that neither do the tuyeres become slagged, nor is there any escape of blast at the slag-spout. It seems probable that only a fusible lead slag of nearly monosilicate composition could be successfully handled in this way, and that difficulties might be experienced in handling the more viscous bisilicate slags used in copper smelting with this ingenious appliance which, however, answers perfectly under the conditions prevailing at Laurium.

The forehearth, shown in Fig. 1, is rectangular, its longest axis being placed crosswise at right angles to that of the furnace. The casing measures 10 ft. x 6 ft. 6 in. x 4 ft. 6 in. deep, and is lined with one course of the chrome-magnesia brick similar to those used for the crucible; the capacity of the forehearth is approximately 30 tons of slag. The molten products issuing from the tap jacket enter the forehearth by means of a

water-cooled copper spout, 7 ft. 6 in. long, made in two pieces as indicated in the longitudinal section, Fig. 1, details of its construction being shown in Fig. 3. The cast-iron spouts at first adopted, even when lined with magnesia brick, became readily perforated by the hot matte and speiss. The present construction of thick copper plate, with no joint or rivet on the surface exposed to heat, is found to be necessary in order to avoid perforation and possibility of leakage with consequent liability to dangerous explosions.

Handling the Furnace Products

The matte and speiss are tapped together from the forehearth usually once in 24 hours and run into one of two tap-pits placed at the side of the furnace opposite to the lead well. The slag may leave the forehearth by either of the two water-cooled spouts on opposite sides, and falls into a cast-iron launder where it meets a stream of water issuing under pressure from a flattened nozzle, the whole of the cooling water from the furnace and tap-jackets, etc., being also utilized in this connection.

The slag is broken up by the powerful stream into granules, the largest particles of which do not exceed 2 mm. in diameter; the average being only 1 mm. Each launder discharges into a sheet-iron hopper, capable of holding 8 tons, and furnished at the point with a flat slide valve moved by a rack and pinion. These hoppers take alternately the whole stream of slag and water, the latter overflowing at one side while the slag accumulates. When one is full the stream is diverted to the other, and the first is allowed to drain for 5 or 10 minutes by means of a perforated section at the bottom immediately above the valve after which the valve is opened by means of a hand-wheel on the pinion shaft and discharged into a wagon holding 8 tons. Two men per shift suffice to handle the slag from the furnace when smelting 300 metric tons per day, besides breaking up and loading all the matte and speiss produced.

The lead overflows from the lead well of an Arent's siphon-tap into one of two steel drossing pots holding 2500 kg. In these it is drossed and tapped at intervals into the usual half-circle of molds on wheels. The accompanying table shows the composition of some of the furnace products. Two partial analyses of shaft accretions are here given but comparatively little trouble is experienced with them since adopting this type of furnace.

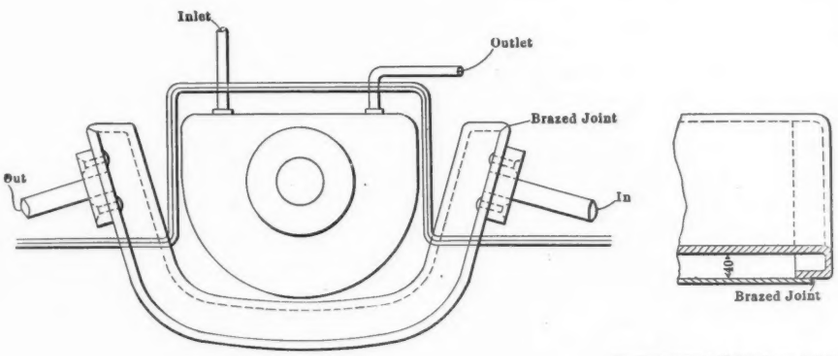

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FIG. 3. TAP JACKET AND SPOUT OF LAURIUM LEAD FURNACE

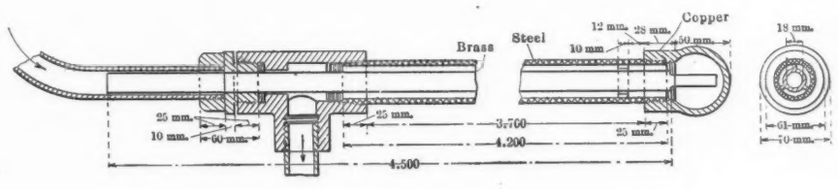

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FIG. 4. SLAG-CONTROLLING DEVICE AT LAURIUM, GREECE

ANALYSES OF LAURIUM FURNACE PRODUCTS.

	Work-lead.	Speiss.	Shaft Accretions		Slag.
			A	B	
	%	%	%	%	%
Pb	97.38	3.00	16.90	16.00	0.80
Bi	0.09	.....	.....	.....	.....
As	0.40	33.00	.....	.....	.....
Sb	1.60	.....	.....	.....	.....
Cu	0.38	.....	.....	.....	.....
SiO_2	.....	.....	.....	.....	25.20
Fe	.....	50.00	.....	.....	23.24
Al_2O_3	.....	.....	.....	.....	11.38
MnO	.....	.....	.....	.....	2.88
CaO	.....	.....	.....	.....	17.33
MgO	.....	.....	.....	.....	traces
Zn	.....	.....	32.25	57.05	9.87
S	.....	.....	12.23	2.73	0.78
Ag	0.1500	0.0150	.....	.....	0.0010
Au	0.0004	.....	.....	.....	.....

With a fuel consumption of 13 per cent. of coke, the furnace puts through from 275 to 300 metric tons per 24 hours of a self-fluxing charge carrying about 11 per cent. lead, of which 90 per cent. is recovered. The somewhat aluminous and zinky slags contain from 0.7 to 0.9 per cent. lead. The whole of the work around the furnace takes only 36 men per 24 hours or 12 per shift, namely, 4 on the lower floor and 8 on the charging floor. The labor cost amounts to only 24 to 26 c. per metric ton of material handled. The substitution of this modern furnace for the old type formerly in use has resulted in great savings in every direction, particularly as regards loss of lead, labor cost and fuel consumption.

For the details here given and for the accompanying drawings, I am indebted to L. Guillaume, chief engineer in charge of the ore-treatment plants of the French Laurium Mines Company and to whose initiative is due the installation of this modern plant, as well as the credit for the successful results obtained.

Direct Cyaniding on the Rand

Special Correspondence

To omit amalgamation altogether in treating Witwatersrand gold ores seems to be a revolutionary step, but it is now seriously proposed. H. H. Johnson, manager of the Village Deep, has won credit by publicly advocating the introduction of a direct-cyaniding, non-amalgamating system of gold recovery for the Rand. From a somewhat different standpoint the idea was put forward by the Denny brothers some years ago. To indicate how strongly the proposal has taken root, it may be mentioned that experiments are now proceeding at the Wemmer mill to prove the economy of the abandonment of the copper plates, while the Bantjes plant has been designed to include shaking tables only below the tube mills and to allow for their omission altogether, if trials elsewhere prove successful. Mr. Johnson's scheme, which is destined to be warmly criticized, involves the retention of gravity stamps, to each 10 of which will be installed a mill of the Chilean type. The mortar boxes will be fitted with screens of ¾-in. mesh, and the Chilean mills 200 to 300 mesh. Tube mills will be used below the latter, so that apart from the rock breakers there will be three distinct units for ore reduction. Chilean mills have been tried on the Rand without success, but Mr. Johnson claims that their failure was due to the wrong class of work to which they were put—on coarse rock from the crushers or concentrates from the stamps.

Legal Status of Works Producing Noxious Gases

Different Phases of the Smelter Smoke Problem in the United States; Expert Damage Board Suggested. Domestic and Foreign Legislation

BY CHARLES BASKERVILLE*

Every individual has the right to have the air distributed over his properties and habitation in its natural condition, that is, free from all artificial impurities.[1] In fact it may be stated that no one has the right to interfere with the distribution and amount of pure air which flows over another's land any more than he has to interfere with his neighbor's soil.[2] This right is strictly a natural one, and every use of property that causes an unwarrantable impregnation of the air with foreign substances to the detriment of another, is a nuisance, and actionable as such.[3] The air must be as free and pure as can be reasonably expected.[4]

Based largely on the preceding, it is laid down broadly as a general rule in law that any act, omission or use of property which results in polluting the atmosphere with noxious or offensive gases or vapors, thereby causing material physical discomfort and annoyance to persons residing in the vicinity,[5] or injury to their health or property,[6] is a nuisance.[7] This rule has been supported by decisions in Delaware,[8] Illinois, Kentucky,[9] Missouri, Pennsylvania, Texas and Wisconsin.

What Constitutes a Nuisance

The question as to what degree of impurity imparted to the atmosphere by one in the use of his property constitutes a nuisance, is one of fact, and is determined by the jury from the circumstances of each case.[10] Injury is, of course, a question of compound facts. No precise tests may be given that are applicable to all cases. In the consideration of the surrounding circumstances of a case, the character and nature of the gas complained of is of prime importance,[11] and the times and periods of the generation of the gas, or the constancy and frequency of the annoyance, the extent of the injury or inconvenience caused,[12] and the nature of the business, its location,[13] management and manner of construction,[14] must all be taken into careful consideration.

To illustrate the last condition, a manufacturing business may be a nuisance because it is located in a residential or populous part of a city or county, whereas it should be located in a more remote locality;[15] or a nuisance may arise merely from the faulty construction of a plant or from the negligent or improper manner in which the business is conducted and the works kept.

Although diminution in value is the proper element of damages and in some cases the actual measure of the nuisance,[16] yet it has been ruled in New Jersey[17] that mere diminution of the actual or rental value of a property is not sufficient to make a business a nuisance. According to common law, a sensible injury is only a visible injury,[18] and in general it may be stated that injuries must not be dependent upon scientific tests to discover.[19] Theoretical injuries furnish no ground for abatement,[20] and an injury to property must be irreparable to cause a court of equity to interfere to abate.[21]

Various State Decisions

It has been ruled in Connecticut[22] that a manufactory which produces such unwholesome odors that the workmen of a neighboring manufactory are prevented from working therein, is a nuisance; and it has been given as a decision in Iowa, Kentucky, Massachusetts, New York, Texas and Vermont, that a noxious trade may be a nuisance even in a remote locality, providing it is located near a public highway and inflicts serious discomfort on people passing by. However, it has been ruled in Tennessee that such odors or gases must be really dangerous to public health and not merely offensive to certain individuals.

Odors which are carried a great distance by the wind and which are "unpleasant and objectionable," according to a decision handed down in North Carolina[23], is not sufficient ground for the interference of a court. Odors or gases must work some substantial annoyance or some material physical discomfort to maintain an action; this point is well supported by precedents. It has been decided in South

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[1]Walter vs. Selfe, *English Law and Equity Reports*, 4, 15.

[2]Saville vs. Kilner, *Law Times*, 26, 277.

[3]Duncan vs. Hayes, *N. J. Equity Reports*, 22, 26; *Wood on Nuisances*, 1, 677.

[4]Huckenstine's Appeal, *Penn. State Reports*, 70, 102; Rhodes vs. Dunbar, *idem*, 57, 275.

[5]Material discomfort to an adjoining property owner and his family, although there is no pecuniary loss, is a nuisance (Kirchgraber vs. Lloyd, *Mo. Appeals Reports*, 59, 59). It is not necessary that an owner should be driven from his dwelling; it is enough that the enjoyment of life and property has been rendered uncomfortable (Fish vs. Dodge, *American Decisions*, 47, 254; Catlin vs. Valentine, *idem*, 38, 567; Barnes vs. Hathorn, *Me. Reports*, 54, 124; Peck vs. Elder, *Sandfords N. Y. Reports*, 3, 126.) It is not necessary that the smell is unwholesome; it is enough that it renders enjoyment of life and property uncomfortable (Davidson vs. Isham, *N. J. Equity Reports*, 9, 189; Brady vs. Weeks, *Barbour's Supreme Court Reports*, New York, 3, 157; Catlin vs. Valentine, *Paige's N. Y. Chancery Reports*, 9, 575).

[6]Use of a process in burning brick by which noxious gases are generated and wafted on the adjoining land, injuring and destroying the crops, is a nuisance such as will support an action for damages (Fogarty vs. Junction City Pressed Brick Co., *Kas. Reports*, 50, 478; *Pacific Reporter*, 31, 1052). Fact that injury is only occasional is immatetial (Campbell vs. Seaman, *N. Y. Reports*, 63, 568; *American Reports*, 20, 567.) In Ohio it has been ruled that if the discharge of noxious gases over a property is continuous and substantially injurious to the health and property, a perpetual injunction should be granted (McClung vs. North Bend Coal and Coke Co., *Ohio Circuit Court Reports*, 9, 259; *Weekly Law Bulletin*, 31, 9). In Pennsylvania the operation of lead-smelting works may be restrained by injunction when they emit poisonous or offensive fumes and vapors causing injury to adjoining property and danger to health (Appeal of Penn. Lead Co., *American Reports*, 42, 534).

[7]For general rule, see *Thompson's Encyclopedia of Law*, 21, 692. For cases in point of rule, see *Cen. Digest*, subject *Nuisance*, sections 164-69.

[8]See State vs. Wetherall, *Harrington's Del. Reports*, 5, 487. It was ruled that smells need not be injurious, but merely offensive to the senses.

[9]In the case of Ashbrook vs. Commonwealth (*Ky. Reports*, 64, 139; *American Decisions*, 89, 616), it was ruled that it is alone sufficient that the odors are detrimental to comfort.

[10]Burnham vs. Hotchkins, *Conn. Reports*, 14, 318; People vs. Davidson, *Cal. Reports*, 30, 379.

[11]Stowe vs. Miles, *Conn. Reports*, 39, 426; Commonwealth vs. Miller, *Penn. State Reports*, 139, 77; Mulligan vs. Elias, *Abbott's N. Y Practice Reports*, n.s. 12, 259.

[12]Stowe vs. Miles, *loc. cit.*; Dittmann vs. Repp, *Md. Reports*, 50, 516.

[13]In the case of Roessler & Hasslacher vs. Doyle (*Atlantic Reporter*, 64, 156), it was ruled that the character of the neighborhood may be considered in determining the kind and degree of annoyance which will be regarded as a nuisance, and that it will not relieve the person who caused the annoyance from liability if the existence of the nuisance is proved.

[14]Fay vs. Whitman, *Mass. Reports*, 100, 76; Pennoyer vs. Allen, *Wis. Reports*, 56, 502; Evansville & C. R. Co. vs. Dick, *Ind. Reports*, 9, 433; People vs. Detroit White Lead Works, *Mich. Reports*, 82, 471; *Northwestern Reporter*, 46, 735; Poynton vs. Gill, *Rolle's English King's Bench Reports*, 2, *Abr.* 140.

[15]Rex vs. White, *Burrow's English King's Bench*, 1, 333; Commonwealth vs. Rumford Chemical Works, *Gray's Mass. Reports*, 16, 231; Smith vs. Phillips, *Philadelphia Reports*, 8, 11; Hole vs. Barlow, *Common Bench Reports*, 4, 334; Fertilizer Co. vs. Malone, *Md. Reports*, 73, 268.

[16]Houghton vs. Bankhard, *Law Times*, 3, 266.

[17]Ross vs. Butler, *N. J. Equity Reports*, 19, 274; see also Rhodes vs. Dunbar, *Smith's Penn. Reports*, 7, 275.

[18]Tipping vs. St. Helen Smelting Co., *English Common Law Reports*, 116, 608.

[19]Salvin vs. The North Brancepeth Coa Co., *Law Times*, 31, 154.

[20]Dorman vs. Ames, *Minn. Reports*, 12, 451.

[21]Wolcott vs. Melick, *N. J. Equity Reports*, 11, 204; Neil vs. Gallagher, *Legal Intelligencer*, 31, 388; also Rhodes vs. Dunbar, *Penn. State Reports*, 57, 274.

[22]Brown vs. Illius, *Conn. Reports*, 27, 84.

[23]Duffy vs. E. H. and J. A. Meadows Co., *N. C. Reports*, 131, 31; *Southeastern Reporter*, 42, 460. In this connection, see Rex vs. Neil, *Carrington and Payne's English Nisi Prius Reports*, 2, 483; Sampson vs. Smith, *Simon's English Vice-Chancery Reports*, 8, 272.

Carolina[24] that where the plaintiff has sustained injury from the escape of noxious gases from the defendant's factory and also injury from other causes, the defendant is not relieved from liability for the injury he has caused.

Dust, smoke and cinders, even when accompanied by noxious gases, are not nuisances *per se*, but amount to nuisances, whether accompanied by noxious gases or not, if they cause injury to neighboring property to such an extent that its value is diminished, or if they so pollute the air as to cause inconvenience materially interfering with physical comfort and the enjoyment of the property (California, Connecticut, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania and Tennessee)[25]. If smoke and its accompanying gases cause sickness or injury to health, an action for damages lies, even though the fuel producing the nuisance is necessarily used[26].

A Ducktown Suit

In the suit of the Ducktown Sulphur, Copper and Iron Company vs. Barnes *et al.*,[27] where smoke and noxious gases from a smelting works injured the property and endangered the health of the adjoining landowners, the action for damages lay, even though the business was being carried on in a suitable locality, with the most improved appliances,[28] and furnished employment to nearly the whole community. It was decided that it is no defense to an action for damages that there were similar establishments in the neighborhood before the plaintiff moved there[29]; and that it is no defense that the works could not be operated without giving rise to noxious vapors. It was decided that the owner was entitled to recover all the damages sustained without reference to the incidental benefits or advantages to the land by reason of the market it afforded for timber and garden products.

The decision in the preceding would seem to indicate that no prescription can be pleaded for a nuisance,[30] and that neither its collateral benefit to the community[31] nor the good intent of the projector is a defense. It would appear that it is alone sufficient to sustain a conviction that the comfort of the community is impaired. However, the findings in some recent cases in Montana in part conflict with the aforesaid decisions and stand out in sharp contrast.

Some Montana Decisions

In the suit of Hugo Magone vs. the Colorado Smelting and Mining Company *et al.*, in which the plaintiff sought $20,000 damages and a permanent injunction for alleged damage to his land and crops through the action of tailings and tailings-waters, the prosecution attempted to demonstrate the cause of the damage by chemical analyses. The defense was based on the fact that the water carried mere traces of possible poisonous salts in solution, and that the soil, which was poor black alkali in nature, was not properly irrigated. Although damages amounting to $1700 were awarded the plaintiff, the injunction was refused on the principle of the "greatest good to the greatest number."[32]

One of the most extensive suits ever heard was the one brought by F. J. Bliss vs. the Anaconda Copper Mining Company and the Washoe Copper Mining Company. This suit involved the question of fumes, and was brought for a perpetual injunction. During the case, it was brought out that the Anaconda company pays more than half of the taxes of Deer Lodge county, where its smelter is located; about one-third of the taxes of Silver Bow county, where its mines are located; and with associated companies they are the principal tax payers in nearly every part of Montana. It was shown that the company had erected a stack 300 feet high and that, before the erection of this stack when they used several smaller stacks, claims for about $340,000 were settled.

The injunction was refused for the same reason as in the preceding case. The amount of damages fixed by the master in chancery was small. A further hearing in the case has been ordered to ascertain if there is not some means of reducing the amount of arsenic in the flue dust, in order that a specific rule may be made which will afford future relief.[33]

The Contra Costa Case

In Contra Costa county, California, where an ordinance was recently passed to regulate the distribution of noxious gases by smelting plants, the board of supervisors of the county have granted the companies involved 60 days time to install apparatus and appliances to prevent the nuisance. County ordinances of a similar nature may yet solve the problem in affected parts of the country, especially in the Western States. City ordinances usually afford little relief[34].

The doctrine that an industry or business erected in the vicinity of similar establishments could not become a nuisance in that locality, or that any exceptions should be made in favor of a business lawful in itself and useful in its results, that is otherwise clearly a nuisance, excepting for the fact of location and usefulness, is generally considered to stand out of the pale of recognition of modern authority and to be entitled to no weight outside of Pennsylvania[35]. However, some jurists, particularly in the western smelting districts where a broader view must necessarily be given to the matter, have rendered decisions which would seem to be contrary to this general rule.

Other Locality Considerations

In the case of Dittman vs. Repp, the Supreme Court of Maryland held that in determining the question of nuisance from smoke or noxious vapors, reference must always be had to the locality. For instance, a party dwelling in a city in the midst of crowded commercial and manufacturing activities cannot claim the same quiet and freedom from annoyance that he might rightfully claim in the country.[36] When the population moves up to a nuisance which was previously in solitude, then as a general rule the nuisance must recede. It must, however, be reasonably offensive.

On its first introduction, gas was declared to be deleterious to the health of the community, and in some localities steam railways were at one time so offensive to particular local authorities, that attempts to prosecute them as nuisances were not infrequent.[37] Grievances of prosecutors in such cases as pertain to damaging gases in particular are often sentimental or speculative—just as they were at the time when the use of gas as

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[24] Frost vs. Berkeley Phosphate Co., *S. C. Reports*, 42, 402; *Southeastern Reporter* 20, 280.

[25] Hyatt vs. Myers, *N. C. Reports*, 71, 271; Bareham vs. Hall, *Law Times*, 22, 116; Reg. vs. Waterhouse, *idem*, 26, 761; Ward vs. Lang, *Jurist*, 35, 408; Jones vs. Powell, *Palmer's English King's Bench Reports*, 539; for Penn. ruling, see *Pittsburg Reports*, 3, 79. In New York, the Appellate Division has recently laid down the law that where the public benefit of the alleged nuisance is greater than the injury to private individuals, there shall be no conviction for maintaining a public nuisance. Under this decision, a company may use soft coal in a crowded portion of New York City or Brooklyn, thereby distributing soot and smoke without being amenable to the criminal law. Civil suits may be brought by property owners, however.

[26] *Hutton's Reports, English Common Pleas*, 135.

[27] *Southwestern Reporter*, 1900, 60, 593.

[28] On this point, see Pinckney vs. Evans, *Law Times*, 4, 147; Waterworks Company vs. Potter, *Hurlstone and Norman's English Exchequer Reports*, 7, 160.

[29] See similar rulings in the cases of Hurlburt vs. McKone (Conn.), *Atlantic Reporter*, 10, 164; and Powder Co., vs. Tearney (Ill.), *Northeastern Reporter*, 23, 389.

[30] For other decisions supporting this, see Drew vs. Hicks, *Pacific Reporter*, 35, 563; Mulligan vs. Elias, *loc. cit.*; and Rhodes vs. Whitehead, *Tex. Reports*, 27, 304.

[31] See in this connection the following cases: People vs. Horton, *Hun's N. Y. Reports*, 5, 516; State vs. Kaster, *Ia. Reports*, 35, 221; Works vs. Junction R. R., *McLean's Federal Reports*, 5, 425.

[32] *Report Proc. Am. Min. Cong.* (Denver), October, 1906, 251.

[33] The Engineering and Mining Journal, Jan. 30, 1909, p. 265.

[34] Let us take the regulations of the Health Department of the City of New York, as an example. According to the Sanitary Code of this Department, Section 96, no person shall cause, suffer or allow offensive or noisome gases or odors to escape or be discharged to the detriment or annoyance of any person not therein engaged. Civil actions for the penalty of $250 only are allowed (Section 1262, *Greater New York Charter*), and it requires a delay of one month in the issuing of an order to arrest a violator, during which time the nuisance continues. When the same is finally abated, the defendant to the action suffers no penalty and pays merely the costs. Jacobi (*Journ. Am. Med. Assn.*, 49, 815), in commenting on this section of the health code, remarks that the "laws, as usual, appear to be made not for the people but for their enemies."

[35] *Wood on Nuisances*, 1, 726.

[36] *Md. Reports*, 50, 522.

[37] *Wharton's Criminal Law*, article "Nuisances."

a fuel was regarded as a nuisance—without due regard to the substantiality of the "nuisance."

Popular Misconceptions

Persons engaged in agricultural pursuits in manufacturing districts invariably have impressions of the destructive action of the waste gases resulting from fuel combustion, etc., upon vegetation, but these are generally founded on observation and tradition. There are many instances of sympathetic juries having fostered these impressions, basing their awards on miscellaneous general evidence and not upon scientific examination. In such cases, too much reliance is often placed on the appearance of individual trees and of isolated trees. Poor soil, exposure to wind, especially dry wind, water supply, insects, and fungi, all produce morphological conditions in vegetation which lead to the gravest misapprehensions in the minds of rural folk, and oft-times accusation of fumes and gases as the cause results, either wrongfully or on *a priori* grounds Ordinary testimony based upon odor alone should as a rule carry little weight.[38]

It is well known that the present sociological and political ideas which obtain in the rural communities, and certain abuses of the centralization of capital on the part of corporations have resulted in injuring the chances of the latter in suits of this nature. While it is true that certain corporations conceal their processes of manufacture, the nature and amount of materials used and the output of product, as well as employ other precautions in order to render the recognition of damage done by fumes more difficult, yet many instances are known where gardens are purposely set out with expensive flowers unsuited to the climate, just to profit by the damages for destruction by "noxious gases," and manufacturers are not protected from such malicious actions.[39]

Expert Board To Assess Damages

Some time since I made the suggestion with the aim of justice in mind that complaints of this nature be settled by a commission composed of three experts in such matters, one being selected by each of the parties and the third being chosen by these two;[40] or two of the experts may be appointed by the court, and a third selected by these two. Such a board of experts could investigate the facts of the case scientifically on the spot, and if damage has been done fix the amount and warn the offenders that a recurrence will bring forth more severe penalties. Negligence on the part of the manufacturers would cease, as well as annoying and expensive interruptions of business. Honest manufacturers would welcome such a change. It is recognized that such settlements would not be looked upon with particular favor by the legal fraternity, but it is interesting to note a recent case brought against the Mammoth Copper Company, in Shasta county, California, was settled by an arbitration board composed of three horticulturists, both parties to the suit having agreed to abide by their decision.[41]

In this connection it may also be remarked for the benefit of those who have not had occasion to investigate the matter, that there is not entire uniformity nor definiteness of statement in the codes of our several States in regard to the contamination of the air or the pollution of streams; cases have been described and citations given to substantiate this assertion. When such contamination becomes wretchedly bad from any cause whatever, protests sometimes check the wrong and secure legislation. The continued pressure of unsubsidized publicity often encourages direct action in these matters.

Cases of Federal Jurisdiction

When a manufactory in New Jersey generates gases which are complained of in New York or when smelter fumes produced in Montana or Tennessee affect the vegetation in a neighboring State, it becomes a Federal matter. In the latter case, we have also the same indefiniteness of statement in our laws.

General rules based upon precedents and not specific regulations obtain; the rule of action is not clear and there is a tendency toward a too technical construction of the law. Some have asserted that there is no need for legislation until there is a demand for it but the law of equity is not the outcome of specific needs and abuses of justice, but is rather contingent upon anticipated conditions; and manufacturers, as well as citizens, desire just protection. As in criminal law, it is to be deplored that cases may be lost in lower courts on judicial rulings which, in other similar cases, are afterward reversed by higher courts.

A Federal decision of great import was handed down in the case of the State of Georgia vs. the Tennessee Copper Company and the Ducktown Sulphur, Copper and Iron Company. The United States Supreme Court held that a State has the right to protect its forests and that a company can be enjoined from operating its smelting works in such a manner as to cause damage to property in a neighboring State. It was held that a State has the right to protect its citizens when their property is subject to damage by operations in another State.

The interest involved in the United States is sufficiently great and distributed to make it appear advisable for the Department of Agriculture to extend its operations and investigations in this field, coöperate with the similar departments in the States, formulate reasonable legislation, and recommend the enactment of a uniform and definite law. In such an event the Government officials would undoubtedly receive the cordial support and encouragement of the owners of the industry. Such has been the case in England where there is in force a law defining what amounts of waste gases may be permitted in the air.

Foreign Legislation

A brief discussion of the foreign laws of importance may not be out of place in this connection. According to Lord Derby's alkali act, the sulphate works of England were not permitted to discharge more than 5 per cent. of the hydrogen-chloride gas produced. This clause was later altered to forbid more than 0.464 gram of HCl per cu.m. With regard to the sulphuric anhydride, the Alkali Works Amendment bill of 1901 prohibits the discharge of more than 4 grains of SO_3 per cu.ft. of residual gas. The result of these laws has been a notable diminution of the amount of acid gases allowed to escape from works—a result not achieved by numerous prosecutions.[42]

Until the beginning of 1907, the lead and copper smelting works in Great Britain were at liberty to discharge their fumes into the air as long as no objections were raised by persons nearby. Now these smelters are included in the new alkali works regulation bill. However, according to Walker,[43] the method of dealing with the existing smelting works is left somewhat elastic by the act. Contrary to the American law, the gaseous output could not be restrained up to 1907 if the population moved up to the works. This is exemplified by the history of Swansea, Wales. In Prussia, in the granting of concessions for new works it is enacted that the amount of sulphuric anhydride in the waste gases should not exceed 5 grams in one cubic meter.[44]

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[38]Concerning the importance of disregarding this sort of testimony, see Gloystine vs. Kentucky Commonwealth, *Southwestern Reporter*, 33, 824; and Walter vs. Selfe, *English Law and Equity Reports*, 4, 15.

[39]It is a general rule that any impregnation of the air with unnatural substances is a nuisance, irrespective of the nature and character of the property affected. See Cooke vs. Forbes, *Law Reports*, 5, *Equity Cases*, 166; Gullick vs. Tremlett, *Weekly Law Reports*, 2, 358. In the case of Campbell vs. Seaman (*N. Y. Reports*, 63, 568; *American Reports*, 20, 567), it was held that articles of luxury come under the protection of the court as much as articles of necessity. The judgment of the Supreme Court was affirmed by the Court of Appeals. Every man has the right to cultivate on his land such products as he chooses. See Broadbent vs. Imperial Gas Company, *De Gex, Macnaghten and Gordon's English Chancery Reports*, 7, 436; Miller vs. Marshall, *Murphy's Reports*, 5, 28.

[40]*Am. Fertilizer*, 14, 12.

[41]The Engineering and Mining Journal, Sept. 21, 1907, p. 561.

[42]See Fletcher, *Journ. Soc. Chem. Ind.*, 11, 120; Carey, *Idem*, 21, 214.

[43]The Engineering and Mining Journal, June 15, 1907, p. 1134.

[44]Concerning the regulation of sulphur gases in Germany, see the "*German Civil Code*," articles 832, 906, 1004, 1011, 1017, 1027, 1065 and 1034; concerning the regulations controlling industrial plants, see "Gewerbeordnung," article 147, II; and for a review of the smelter smoke status in Germany, see Gradenwitz, The Engineering and Mining Journal, Aug. 17, 1 p. 311.

Uniform Federal Law Impracticable

An objection which has been urged against the regulation of the amounts of acid gases discharged into the air is this, that it is not practicable to establish a permissible amount of noxious gas which may be emitted for *all parts* of a country owing to geographical and meteorological conditions.[45] This is indeed well founded.

Other important questions to be considered in the formulation of a Federal law, such as referred to, are the enforced selected location for smelting works, etc., preferably on plains or level portions of the country, with due regard to winds, and the advisability of enforcing the adoption of tall stacks and chimneys by all works generating noxious gases. In regard to the first, it has been suggested that smelting companies be given the right to condemn land within a certain radius of their works, especially if they were located before the advent of a definite number of people. Such a bill passed the legislature of Utah but was disapproved in 1907 by Gov. J. C. Cutler on the ground that such a measure bore the marks of class legislation. The Utah bill provided for the condemning of land within a radius of four miles from a smelter in counties of less than 75,000 people.

As to the second question, the assumption that higher chimneys will diminish the amount of damage done by allowing the acid gases to become more dilute before reaching the vegetation is not realized, according to the experience of many industrial concerns. Notwithstanding the fact that unquestionable benefits are derived from dust chambers and the contrivances associated with high stacks, and the fact that the adjacent vegetation is not so much injured from a high as from a low stack, there is considerable damage wrought by gases from high stacks, as remote vegetation is reached by smoke, etc., which would not be otherwise affected.[46] In damp, heavy air, fumes heavier than air fall rapidly to the ground, and when the wind blows the gases sink gradually, but hold together for considerable distances, so that no unusual dilution is effected by such means.

Reclaiming Devices

In conclusion, the main solution of the "fume question" and "air pollution" would seem to be in the enforced use of waste-reclaiming devices by the enactment of a Federal law regulating the amounts of waste gases to be permitted to pass into the air. In England the enactment of similar laws laid the foundation of the great chloride of lime industry, and the subject has received merited attention since 1863; in fact, one might say since 1836, the year in which Gossage solved the problem of hydrochloric acid condensation.

In Germany, after extensive experiments in 1848 the furnaces in the smelting districts were remodeled and the volume of the dust chambers increased. This proved advantageous to the smelters, as the following shows: the Freiberg Smelting Works paid 55,000 marks for damage in 1864 and but 4793 marks in 1870, after installing means of condensing the acid gases.[47] In our own country it is encouraging to note that some manufacturers and smelters have at last begun the installation of waste-recovering contrivances—surely a decided step toward the solution of a great national industrial problem, however novel and radical such devices may appear. One large concern, the Tennessee Copper Company, contemplates the production of 300,000 tons of tower acid per annum from the gases delivered from its smelting furnaces, and no fear of trouble in disposing of the product is entertained by the officials.

[45] Haselhoff and Lindau, "*Die Beschädigung der Vegetation durch Rauch*," 1903, 394.

[46] Reuss, "*Rauchbeschadigung in dem von Tiele-Winkler'schen Forstreviere Myslowitz-Kattowitz, Insbesondere Ermittlung, Bewerthung und Vertheilung des Rauchschadens.*" Goslar, 1893.

[47] Ost, *Zeit. f. angew. Chem.*, 20, 1689.

The Fuel Question in California

Special Correspondence

Rather an odd thing is happening in the matter of use of fuel for manufacturing, milling, etc., in California. Before the advent of oil as fuel, either wood or coal was used. At mills in the interior wood was largely used and also at mine furnaces. In the cities and towns manufacturers used coal. During a shortage of coal here shippers began to send in large quantities of coal from Australia and British Columbia and the market is now much overstocked because the cargoes continue to arrive, notwithstanding there is plenty of coal on hand. The result is that coal prices have dropped. Meantime the prices for fuel oil have much more than doubled and this in the face of the fact that there is an overproduction. Large quantities are being shipped abroad, as much more is produced than can be used on the Pacific coast. Still the oil continues to be used though the coal prices have fallen, and those of oil increased. A few years ago oil was bought from producers in the valley at 19c. per barrel by the large companies which distribute it. They did not add a very much higher rate for consumers and thousands of people put in oil-burning plants, giving up the use of coal entirely. The liquid fuel was cheaper, cleaner, did away with firemen, and permitted the user to regulate his desired heat closely. People have now got used to it and do not want to change back to coal again. And now the big companies owning the pipe lines, and distributing the oil, have raised the prices three or four times as high as when men originally put in oil plants. Quartz mills throughout the State have big oil tanks to keep their supplies and have their boiler furnaces arranged for oil. They do not want to change any more than manufacturers do. All of this is fine for the big oil companies. Still some men are about changing. An instance in point is of one man who formerly bought 500 tons of coal monthly and for the past four years has been using oil. Now he is trying to make contracts for coal again, fearing that oil will go still higher in price, when it will cost him more than coal for his purposes.

The largest quicksilver mine in the State installed a fuel-oil plant, with tanks, etc., and hauled the oil in 45 miles by team. The increase in price has made this company go back to the use of wood again. The mine is in a forest reserve, and the company buys from the forest service all the wood it needs. The foresters mark the trees and the company cuts the wood, paying stumpage to the Government. The arrangement is found to be satisfactory and cheaper than the oil at present prices. It is acknowledged that the oil for roasting the cinnabar ores was an ideal fuel, because the heat could be graduated to a nicety, there was no smoke and the ores were roasted in the manner desired. With the wood, more men are necessary to feed the furnaces and the roasting is not accomplished so well. It seems, from these statements, that the people in California are in a sort of transition state in the matter of fuel. If the price of oil is still farther increased many will undoubtedly go back to using coal.

In sampling metals (*Aust. Min. Stand.*, Dec. 9, 1908) they should never be filed, as the abrasion of the file will add enough iron to the samples to affect the assay for that metal. This is true even of spelter, which is comparatively soft. Samples of metals and alloys should be obtained by drilling whenever possible. If the specimen is too small for drilling, it should be chipped with a sharp cold-chisel.

A shipment of 2500 tons of manganese ore from Caledon, South Africa, to Antwerp is reported by the *South African Trade Journal*. No further shipments will be made until the results of the treatment of this first cargo shall have been ascertained. In addition to its resources in ore of this quality, the mine is said to contain abundant ore of lower grade.

The *Queen. Gov. Min. Journ.* estimates the coal produced in New South Wales during 1908 at 9,147,025 tons, valued at £3,353,093, exceeding that of the previous year by 489,101 tons and £430,674 in value, and establishing a new record. In the course of 10 years the output has more than doubled.

The Coast District of British Columbia

SPECIAL CORRESPONDENCE

An interesting report, recently issued[1] by the Geological Survey of Canada, covers that portion of the coast of British Columbia lying between the international boundary and the mouth of the Powell river on Malaspina strait, including Burrard inlet, Howe sound, Jervis inlet and the adjacent islands. The greater part of this region had not been previously examined geologically. The present report is of a preliminary character, exploration being conducted only when the formations were of economic importance. The rocks of this region are largely of igneous origin, representing a great range from acid to basic in composition, and from volcanic surface flows to deep-seated plutonics—rocks of aqueous origin having a comparatively small distribution. The principal areas of economic importance are those occupied by the Paleozoic rocks, the mineral deposits occurring in them or along their contacts. The prospector has to contend with many difficulties in this coastal belt, the whole country being extremely rugged and difficult of access, while rock slides, a luxuriant forest growth and dense underbrush below the 4000-ft. level conceal the contacts and mineral outcrops. In most cases the discovered mineral deposits of value are so situated that economic methods in mining and transportation are feasible. Surface or aërial tramways may connect the mines with tidewater, and from there transportation is afforded to the smelters. The principal metallic ores are those of copper and iron.

MINERAL AREAS OF THE COAST DISTRICT

The report gives a detailed description of the known mineral areas grouped with reference to the inlets and islands. Lynn Creek camp, Burrard inlet, is about eight miles north of North Vancouver, and comprises an area of about five square miles, in which about 35 claims have been staked. The ores consist of zinc-blende, chalcopyrite, pyrite, pyrrhotite, molybdenite and magnetite, which occur as irregular bodies along shear and fracture zones in the schists. The preliminary work done on these claims consists of stripping, small open cuts and tunnels, but in no case has sufficient work been done on any location to prove its value. On the Kemptville claims two veins of almost pure zinc-blende 2 ft. and 3 ft. wide, respectively, have been discovered, and on Angel claim No. 3 small bodies of yellow copper have been opened up. While some of the orebodies may prove of sufficient size to make them commercially important, in any case, owing to the cost of mining and transportation, it will be necessary to amalgamate the several interests to insure successful results.

BRITANNIA MINERAL ZONE

The Britannia mineral zone is situated on the east side of Howe sound, 23 miles from the entrance. The associated rocks belong to the Britannia group, consisting of conglomerates, quartzites, carbonaceous slates and quartz-sericite schists, with intercalated sills and masses of hornblende porphyrites and quartz-syenite porphyries. They have a width along shore of 1½ miles and extend inland for more than 8 miles. The mineralized zone lies almost wholly in the quartz-sericite series. Iron and copper sulphides were deposited simultaneously with the development of the schist, during the eruptive after-action produced by the intrusion of the granite. A concentration took place in parts of the zone and lenses of massive chalcopyrite with quartz were formed in parallel arrangement along the strike of the schist. These lenses range from an inch to several feet in width and are the source of nearly all the clean ore. About 70 claims have been staked along this zone and adjacent to it. The principal groups are controlled by the Britannia Copper Syndicate, Ltd., the Empress Mining Company, and the Goldsmith Copper Company. The Britannia Copper Company had mined and shipped up to Jan. 1, 1907, a total of 168,396 tons, of which 42,552 tons were shipping ore, and 65,844 tons concentrating ore, producing 12,612 tons of concentrates. The ore is essentially low grade and about 60 per cent. has to be concentrated before shipment for smelting. The company has an extensive plant, well equipped for the economical handling of the ore. At the mine the rock is first crushed at the head of the tramway and passed on a conveyer, where clean ore and waste are picked off. The Riblet automatic aërial tramway, 16,800 ft. long, connects the mine with the concentrator and shipping dock at the beach. The Britannia West Copper Company, whose claims also produce a low-grade ore said to carry appreciable values in gold and silver, were also installing a concentrating plant and building a tramway to the shore.

BOWEN ISLAND AND SEECHELT

The Bonanza mine on the southwest slope of Mount Gardiner, Bowen island, where a tunnel has been driven in for 300 ft., yields ore composed of pyrite, zinc-blende and galena, which carries also gold, silver and lead. On Jervis inlet deposits of pyrrhotite, chalcopyrite and arsenopyrite, were found in several places, and some claims had been staked. Assays gave no traces of gold or silver.

On Seechelt inlet, about three miles inland from the east side of the head of Salmon arm, at an elevation of 4500 ft. above the sea, the Granite Mountain Copper Company has 18 locations. The country rock is granite and the ore occurs in fissure veins which are nine in number varying in width on the surface from 3 to 25 in. The ore is massive bornite with a little chalcocite and cuprite in quartz gangue. An assay of massive ore gave 0.4 oz. gold, 35 oz. silver and 53 per cent. (wet) of copper. Should development prove the orebodies to be extensive, an aërial tram could be built to Salmon arm for the transportation of ore.

TEXADA ISLAND

On Texada island, which lies in the Strait of Georgia, its southeast end being 80 miles north of Victoria and 47 miles from Vancouver, copper has been mined for over a decade and the output has been characterized by a high percentage of copper with good gold and silver contents. The magnetite deposits have been known since the early sixties, but development work has been desultory and comparatively little ore has been shipped. The island is 30 miles in length and its maximum width is 6½ miles. The western half of the island is more or less mineralized throughout, and has been nearly all staked at one time or another. The ore deposits occur in the Texada group and along the contact of that group with the Marble Bay limestone formation. In the Texada group the ores are found along shear and fracture zones in the basic eruptive rocks, and comprise galena, zinc-blende, chalcopyrite and pyrite, carrying, as a rule, small amounts of gold and silver. The veins are from 2 to 4 ft. wide, in one case 12 ft., and from 20 ft. to over 300 ft. long. Of the contact deposits the most considerable are the occurrences of magnetite and copper on the property of the Puget Sound Iron Company, and those of copper at Van Anda. The former, situated on the southwest side of the island, outcrop along the southern flanks of a ridge parallel to the shore, occurring over an area of one mile in length by half a mile wide. About 15 distinct bodies are exposed along the contact of limestone with granite and the greenstone. The most important deposits are known as the Texada, Paxton and Lake mines. The ore of the Texada, where considerable development work has been done, is a coarse crystalline magnetite, which is locally impure from impregnations of copper and iron pyrites, some of the ore having carried as high as 3 per cent. copper.

A tunnel over 300 ft. long passed through 74 ft. of magnetite. At the Paxton the orebody is 320 ft. long, with a width of 240 ft., and a hight of 92 ft. The Lake mine, one mile east of the Texada, has an orebody nearly 200 ft. long, 50 ft. wide and 70 ft. high in one locality. Little has been done in exploiting other de-

[1]Preliminary Report on a Portion of the Main Coast of British Columbia and Adjacent Islands included in New Westminster and Nanaimo districts. By O. E. Leroy; pp. 56, illustrated; paper: 9¾x6½ in. Geological Survey of Canada, Ottawa, 1908. King's Printer.

posits beyond delimiting their boundaries superficially. Much of the ore now exposed would have to be roasted to free it from sulphur. Regarding the variable amounts of copper disseminated through parts of the orebodies it will probably be found that judicious selection would prevent the copper content in the roasted ore becoming high enough to vitiate materially the product for cast iron or steel. Several analyses are given showing iron contents of the ore ranging between 65.71 and 69.85 per cent. The total amount shipped probably does not exceed 20,000 tons, the greater part of which was smelted at Irondale, Wash. The deposits present good facilities for economic mining, principally by a system of quarries and tunnels. Closely associated with the magnetites is a series of copper deposits consisting of chalcopyrite and a little carbonate, occurring as small irregular bodies along the contact of the limestone with the chlorite schist and magnetite. Over a dozen bodies have so far been discovered and some of them worked out. It is stated that over $10,000 worth of ore has been mined.

The ore deposits which occur wholly in the limestone have their chief development in the vicinity of the town of Van Anda. The three principal mines are the Copper Queen, Cornell and Marble Bay, of which the latter has been most extensively developed. It is owned by the Tacoma Steel Company, which holds about 1500 acres in the western part of the island. The mine is 771 ft. deep and the orebody from 260 ft. to the present workings has varied in length from 70 to 105 ft., and in width from 5 to 45 ft. The ore is bornite with subordinate chalcopyrite and a little pyrite, pyrrhotite and molybdenite and is throughout essentially high grade, carrying good values in gold and silver. About 13,000 tons are mined and shipped annually. The mine is well equipped with a modern plant. At the Cornell mine the ore near the surface was rich, the product between the surface and the 160-ft. level being valued at $270,000; some of the ore yielding 1.25 oz. of gold to the ton.

Quarry and Lime Production

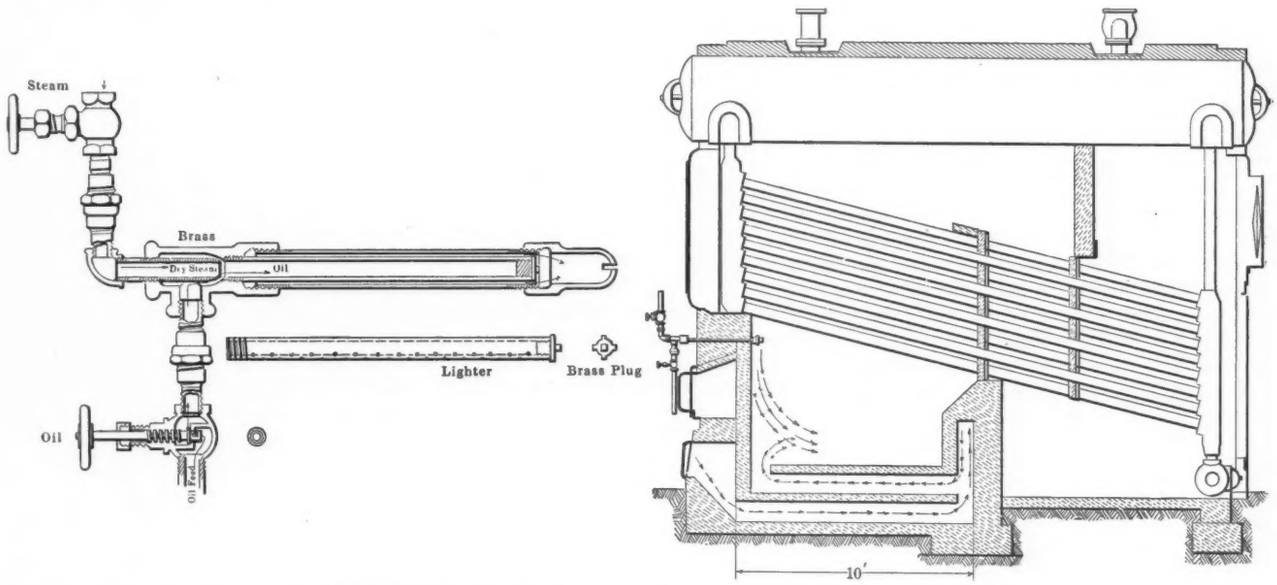
There are a number of quarries along the coast which furnish building stone and scrap for concrete and road metal. The limestones of Texada island are generally pure and when burned furnish a lime of excellent quality. The Tacoma Steel Company has two kilns on Limekiln bay on the northwest end of the island, which have an output of about 120 bbl. of lime per day. Very pure clays are found on the north arm of the Burrard inlet, at the head of Howe sound on the east side and on Anvil island. On West Thormanby island a fine, pure clay occurs, which, on drying, produces a fine powder, which makes a good natural powder for metal polishing.

Noiseless Furnace for Burning Crude Oil

The accompanying illustration shows an arrangement of a boiler furnace fitted with a Witt crude-oil burner which protects the flues of the boiler from the direct flame, preheats the air supply and produces a noiseless fire. The air is admitted through flues below the fire-box leading to the bridge and returning directly under the oil burner. The burner is placed directly under the tubes, but since the heated air enters at the bottom of the combustion chamber, the flame is not local but the fire is distributed throughout the furnace.

The Tres Hermanas District

The Tres Hermanas mountains, south of Deming, N. M., and 10 miles north of the Mexican boundary line, were the scene of considerable activity in the early mining days of that State, lead being the principal metal produced at that time. In 1904, attention was attracted to a heavy, white, massive or crystallized material occurring plentifully in the old lead workings. This material was found to consist of carbonates and silicates of zinc. The zinc ores include large quantities of the unusual mineral willemite (the pure anhydrous silicate of zinc), smithsonite (zinc carbonate), hydrozincite (basic zinc carbonate), and calamine (hydrous zinc silicate). Shipments of the zinc ore were made to smelters in the Mississippi valley in 1905, but in 1906 and 1907 little activity was apparent. A geologic examination of the north end of the Tres Hermanas district was made during the field season of 1908 by Waldemar Lindgren, of the U. S. Geological Survey.



DETAILS OF WITT CRUDE-OIL BURNER AND AN INSTALLATION IN A NOISELESS FURNACE

The *Marine Review*, of Cleveland, Ohio, reproduces some figures as to Lake rates on iron from a report made 25 years ago. The contracts made in the winter of 1882 were at the rate of $1.40 per ton from Escanaba to Cleveland and $1.75 to $2 from Marquette. The total amount landed at Cleveland that year was 2,900,431 tons. In the winter of 1883 contracts were made for bringing ore from Escanaba to Cleveland at $1 to $1.10 per ton, and from Marquette at $1.15 to $1.25; the closing prices were at $1.40 to $1.50 from Escanaba and $1.75 to $2 per ton from Marquette. The total amount brought down in 1883 was 2,300,351 tons.

Mines of the Lordsburg District, New Mexico

By J. L. Wells*

The renewed activity in the Lordsburg mining district may make of interest a review of the mines of this southwesterly portion of New Mexico. The Lordsburg district comprises two mineral sections, locally known as the Virginia and the Pyramid districts. The principal mines are situated from 2½ to 9 miles southwest from the town of Lordsburg, which is on the Southern Pacific and the Arizona & New Mexico railroads. An able article by Prof. Fayette E. Jones, with an accompanying map of the district, was published in the Journal, Sept. 7, 1907, outlining the history of the camp and describing the ore deposits. Since the notes were taken for the article referred to considerable development work has been done in the district.

The principal properties being developed are the Eighty-five, Miser's Chest, Bonney, Last Chance, Nelly Bly and Robert E. Lee. All of these mines give encouragement from this development, the most favorable results being shown on the Eighty-five and the Nelly Bly, where the most work was done. On the Eighty-five property during 1908 there were completed 200 ft. of shaft from the main tunnel level on the Emerald vein, and two levels were developed disclosing a vein from 4 to 12 ft. in width. A second level, which is 200 ft. below the tunnel level, is approximately 400 ft. below the surface of the vein at its outcrop on the mountain.

From these workings on the Emerald vein there were shipped during 1908, about 1000 tons of ore. The ore from this vein is highly silicious, carrying from 60 to 90 per cent. silica, 0.1 oz. gold, 3 oz. silver, and 3½ per cent. copper. In the lower levels the vein matter is softer and native copper is found as well as several varieties of copper ore. The ore of the Superior mine to the southwest is of higher grade, but is supposed to be an extension of the Emerald vein. The ore of the Atwood and of the Eighty-five mine is also highly silicious and of approximately the same grade as the Superior ore.

There were about 7500 tons of ore shipped from this vicinity during 1908, this tonnage coming mainly from the Superior, Eighty-five, Atwood and Bonney mines. These ores were shipped to the Copper Queen reduction works, at Douglas, Ariz., and were used principally for converter lining. Among the other mines of this district, which have not been operated during the last year, are the Aberdeen, Nelly Bly, Last Chance & Clara Sutton, Venus group and Robert E. Lee. The Nelly Bly and the Robert E. Lee are adjoining mines and each has produced high-grade copper-silver ore. The Nelly Bly resumed operation the first of this year. The Last Chance & Clara Sutton has also resumed and is sinking the main shaft which is at present about 300 ft. deep. The surface ore of this mine contained principally silver, but copper is now becoming a factor. The mine has produced over $100,000 worth of ore.

The Venus group has been considerably prospected over the surface to a depth of from 10 to 180 ft. The main shaft on the Venus claim is 308 ft. deep, and there are several hundred feet of drifts and crosscuts. There are two veins included in this development which, as far as have been disclosed, are from 50 to 100 ft. apart on the Venus property, but diverge as they pass to the southwest into the Last Chance property. The east vein which is the stronger of the two is almost vertical. It averages over 6 ft., as developed, and at the 225-ft. level it is 10 ft. wide.

The west vein dips to the east at an angle which would indicate that the veins will be joined together at a depth of 500 ft. It averages 4 ft. in width and the principal development has been done on this vein. From it there have been over 5000 tons of ore milled by the pan amalgamation process, the high-grade ore being shipped to the smelters. The principal metal in these veins is silver, with small amounts of gold, copper and lead associated. The mine has produced over $200,000 from these workings.

There are two other well defined veins on the property, which have been developed in different places to depths from 40 to 180 ft.; one of these carries more copper and gold than the Venus and the other a higher average silver content. The veins of this group are influenced by a shattered zone and are intersected by numerous small veins and seams which in many cases carry high-grade ore; from one of these intersecting veins in the Venus workings, several tons of ore were taken that sold for $1489 per ton. There remains developed in the Venus workings over 14,000 tons of ore, having it is said an average content of 18 oz. silver per ton.

To the west, between this group and the Nelly Bly and Robert E. Lee, a location was made last year by D. W. Briel and T. A. Lister, on which some exceptionally rich ore was discovered at the surface. The ore carried 6 per cent. copper but ran very high in silver. This vein has not been prospected enough to determine its length in either direction. To the south about nine miles from the Venus group, is an undeveloped district in the vicinity of South Pyramid mountain. Rich silver ore has been discovered in some of the prospects there.

The Aberdeen mine, owned and operated by the Penn Mining Company, has resumed operation and will sink the shaft to the 600-ft. level, with capital now in the treasury, and by those in position to know it is stated that they will probably continue to a depth of 1000 ft. If this plan is carried to completion, the owners will doubtless prove their holdings to be more valuable and also demonstrate, what is much needed in this district, that the mineral deposits are not all on the surface. There has been no deep mining in this district, 400 ft. being the deepest workings, and this depth only in the Eighty-Five, Superior and Nelly Bly. Considerable money has been spent in the district but much of it wasted, through ignorance, in shallow surface work, building mills and buying traction engine outfits.

*Lordsburg, New Mexico.

Evolution of the Gravity Stamp Mill

By Algernon Del Mar*

It is a remarkable circumstance that the ancients who were in many respects first-rate engineers should have overlooked the possibilities of a mechanical device for crushing gold ores. It cannot be that they were lacking in the necessary engineering skill but rather that they could not see the advantage of combining a water wheel with the pestles already familiar to their workmen and thus save the labor and feed of many men. The sole reason must have been that while slaves were cheap machinery was not necessary but when slave labor was no longer available or had become expensive, the crude gravity stamp mills were evolved from methods and appliances long known to the ancients.

The system of gold milling practiced in Egypt in ancient times will be described to show that the next step was easily attainable and required no great amount of adaptability. The quotation is cited from Diodorus Siculus: "When the stone containing the gold is hard, the Egyptians soften it by the application of fire and when it has been reduced to such a soft state that it yields to moderate labor, several thousand of these unfortunate people treat it with iron picks. Those who are above thirty years of age are employed to pound pieces of the stone of certain dimensions with iron pestles in stone mortars until reduced to the size of a bean. The whole is then transferred to women and old men who put it into mills arranged in a row, two or three persons being employed at the same mill, and it is pounded until reduced to a fine powder. (Here we have a stamp mill operated by three persons lifting a heavy pestle presumably of iron and probably with a wooden stem.) At length the masters take the stone thus ground to powder and carry it away to undergo the

*Mining engineer, South Pasadena, Cal.

"final process." The final process was "to wash on inclined tables furnished with two cisterns, all built of stone." Here we have what corresponds to a modern canvas plant. Evidently the amount of ore crushed was too great for slaves to pan, so it was run over tables with a stream of water.

Although we have no description of a gravity stamp mill being used by the Romans it would have been only a short step in evolution to have used mechanical power to lift the heavy pestles used by the Egyptians. From the Hungarian mines there are remains that date from the fifteenth or sixteenth century. The tilt-hammer used in China has been described by Henry Louis.

From the sixteenth century to the time of the discovery of gold in California little improvement was made in the gravity stamp. It was a crude affair consisting of three or four stamps. Each stem consisted of a square wooden beam usually of oak, 12 ft. long and 6 in. square, the shoe of cast iron being inserted in the wooden stem and bound with iron bands and tightly wedged. The mortar was either open, or a wooden box the bottom of which was composed of hard quartz fragments tightly beaten in with heavy iron rams.

Sometimes the screens were of punched iron but more often the discharge was simply over a side of the box which could be moved up and down to alter the fineness of the crushed pulp. The stamps weighed from 150 to 250 lb. and were dropped from 8 to 12 in. about 70 times per minute. The cams and tappets were of wood and the stamps were lifted, without turning, in pairs when the battery was composed of four stamps, and alternately when of three stamps. Even the idea of five stamps and lifting in the sequence that gives the best flow of pulp is of late origin. The oldest mills in California had four stamps in a battery all on one cam shaft. Plumas county has many such mills. It is said that six stamps were sometimes put in a battery and can be seen in Mexico today.

The modern stamp mills of the best type as used in different parts of the world are simply the refinement and perfection of these early types, made possible by the improvements in the materials of which the different parts are made. Our stamp now weighs from 1000 to 1700 or even 1800 lb. and drops from 6 to 8 in. at the rate of 100 to 110 drops per minute.

It was the discovery of gold in California and Australia and the high cost of labor, that made necessary improved machinery for crushing ore and from this necessity the old gravity mill was improved upon until we have the stamp mill in its present state of perfection. The original stamp mills as well as the mortars of the ancients were used simply to break ore that had already been subjected to a preliminary process of communition. It is a curious fact that the stamp mill is gradually reverting to its original use as a crusher for rock of medium size.

When the cyanide process was unknown or in its infancy stamp mills were in general use as amalgamators for it was found that a thorough admixture of mercury with gold in the mortar often saved more gold than when the processes of crushing and amalgamating were conducted separately. With the introduction of the cyanide process and the finer grinding of the ores, amalgamation has to a great extent been given up, so that the gravity stamp mill is gradually occupying the place of an intermediate crusher between the rock breaker and the fine grinder. As a coarse or fine crusher it is excelled by other machines, but as occupying the place described above in the process of winning gold from its ores it has no peer.

As the use of the cyanide process for the extraction of gold increases the purpose of the stamp mill is becoming simply a crushing machine. Its simplification from a battery of five stamps to that of one stamp is taking place at the same time, for it has been found that the single stamp crushes more ore per unit or per horsepower than when more stamps are arranged in the same battery. The amount of labor, however, increases with the single batteries so that especially where labor is high a 5-stamp battery with a narrow mortar will in the end be more satisfactory than five single stamps. When amalgamation is necessary inside the battery a roomy 5-stamp battery is used and not the single unit.

Metallurgical Treatment of Jamesonite Ores*

By G. P. Ives and I. D. Ossa

In the ore from the Black Hills, the jamesonite is associated with quartz, servantite, and sometimes small amounts of galena. This ore occurs in comparatively narrow veins and cuts across the formation of Algonkian schists and slates, and can often be traced for considerable distances. Jamesonite is of value as a commercial source for the metals lead and antimony. Also the gold and silver usually contained may be recovered.

Under the supervision and advice of Prof. C. H. Fulton and Prof. M. F. Coolbaugh, an effort was made to find standard economical methods for the treatment of this rather complex ore.

The ore was crushed to the proper size and roasted to 2 to 3 per cent. sulphur. The roasted ore, properly fluxed, was smelted in a cupola-lead furnace to a lead-antimony alloy or bullion containing also the precious metals. It was found advisable during the operation to form a copper-lead matte, which was done on a small scale, due to the scarcity of copper ore. The lead-antimony alloy was electrolytically refined by the Betts process, and gave a clean and economical separation of lead, antimony, gold and silver.

The ore furnished was of two lots which showed the following composition: No. 1: SiO_2, 66.5 per cent.; FeO, 6.02; CaO, 0.7; Al_2O_3, 5.33; S, 4.1; Sb, 4.2; Pb, 7.95; Zn, 1.5; As, 0.3. No. 2: SiO_2, 35 per cent.; FeO, 3.85; Al_2O_3, 1.3; S, 9; Sb, 17.5; Pb, 32. The first lot of ore was of low grade and could easily be concentrated, while the second lot was smelted directly, mixed with the fines of the mechanical concentration, previously roasted or sintered.

Roasting Jamesonite Ores

The proper temperature for the oxidation of the antimony sulphide seems to be about 350 deg. C. When this temperature is reached, the atmospheric oxygen converts the sulphide into sulphur dioxide and antimony trioxide. In the presence of an excess of air the antimony trioxide is oxidized to pentoxide, and this, combining with some of the trioxide, forms the tetroxide. The presence of an excess of air is an essential point in the roasting of antimony sulphide, for it is necessary to conduct the roasting operation in such a way as to oxidize all the antimony to the tetroxide. The trioxide is volatile at temperatures higher than 350 deg. C. Some part of the trioxide, in the presence of oxide of lead and air forms a lead antimoniate; it seems that there is no formation of sulphate of antimony.

After the oxidation reactions have taken place the temperature is raised, resulting in the formation of lead silicate. This reaction takes place between 700 and 900 deg. C., and the combination is effected without the mixture becoming fluid. At this time, if the temperature is kept constant, the lead silicate starts to fuse, sintering and agglomerating the furnace charge which is taken off.

The 2990 lb. of first-class ore was roasted in a Brückner furnace, using wood as fuel. The furnace took charges weighing 250 lb. each, and the roasting to the sintered state lasted about two hours per charge. The roasted ore, amounting to 2927 lb., was of the following composition: SiO_2, 35 per cent.; FeO, 4; Al_2O_3, 1.36; Pb, 32.5; S, 4.15; Sb, 15.4.

The operation of roasting is necessarily divided into two parts, viz: (1) Roasting at a low temperature with free access of air. (2) Sintering of roasted product at a relatively high temperature.

Smelting

The roasted ore was smelted in a small cupola furnace. The first problem to solve was the calculation of the furnace charge, taking into consideration that it was advis-

*Abstract of a thesis submitted to the faculty of the South Dakota State School of Mines, May 15, 1908.

able to smelt all or very nearly all of the low-grade ore and that the formation of matte was not only advisable but strictly necessary for the proper running of the furnace. It soon became evident that the low percentage of lead in the charge was causing a considerable loss. Therefore, the charge was changed to a typical lead charge.

To start the furnace a cordwood fire was made in the crucible and kept burning for 24 hours. When the well was hot, all ashes were removed and the lead well cleaned. Lead was then put in and the breast closed up with firebrick. Cordwood was charged from the top and ignited through the tuyeres. The tuyeres were set in place and a slight blast turned on. The furnace was charged to three-fourths of its hight with coke; on top of that the blowing-in charge, consisting of 100 lb. of slag and 30 lb. of coke. After the second blowing-in charge was added the first regular charge was added. A blowing-in charge was added every fourth charge for the first four or five hours.

The bullion produced showed the following analysis: Lead, 78.8 per cent.; antimony, 16; copper,3.5; gold, 3 oz. per ton; silver, 37 oz. per ton. The matte made was of the following composition: Lead, 2.14 to 3 per cent.; copper, 7.30 to 11.97; antimony, 0.56 to 1; silver, 13.68 oz. per ton; gold, 0.24 oz. per ton. The slag made during the smelting operation closely resembles the following: SiO_2, 30 per cent.; FeO, 33; CaO, 18; Al_2O_3, 6. The slag was of the general formula:

$$x\ (RO.\ SiO_2) + y\ (2\ RO.\ SiO_2).$$

It was calculated to correspond to the formula:

$$RO.\ SiO_2 + 6.9\ (2\ RO.\ SiO_2)$$

It is mainly a mono-silicate, the silicate degree being 1.08.

We believe the formation of a slag rather high in silica and lime is most suited for the operation and we suggest a slag of the following composition: SiO_2, 36 per cent.; CaO, 25; FeO, 26; Al_2O_3, 7. This will answer the requirements admirably, either from a purely metallurgical or economical standpoint.

The smelting of jamesonite ore can easily be done in a blast furnace without previous roasting and we firmly believe that losses of antimony will be in this case greatly avoided. While it will be necessary to roast the fine concentrates, the coarse concentrates and first-class ore can be smelted directly, after mixing them in such a way as to form 8 per cent. matte fall. It is desirable to have some copper in the matte and it will, therefore, be necessary to add some oxidizing copper ores or rich copper sulphides. The matte formed can be resmelted to a 30 or 40 per cent. copper matte and shipped to a copper refinery, while most of the lead of the first matte formed may be recovered in the resmelting operation.

The volatilization of antimony in the blast furnaces cannot be lower than 10 per cent. of the antimony in the ore. This may be recovered by passing the fumes to a bag-house. If the ore is roasted, the recovery of the antimony is a little more difficult, due to the fact that the roasting fumes cannot be filtered by the bag-house system.

Electolytic Refining of Lead-antimony alloy

The Betts process for the electrolytic refining of lead or base bullion is based on the fact that, if in a dilute solution of lead fluosilicate, the impure metal is used as an anode, while a sheet of pure lead is used as a cathode, the electrolyte dissolves the lead of the impure anode and deposits the lead free of impurities on the cathode. The Betts process has been successfully used in three or four electrolytic refineries of this country and has proved more advantageous than the old Parke's process for the desilverization of lead bullion.

The recovery of the precious metals can be accomplished by smelting the final slimes which contain mainly Au, Ag, accompanied by Cu, Sb, Pb, etc., properly fluxed in graphite crucibles, so as to form a "doré bullion" containing certain base metals as impurities. The doré bullion cast in the form of anodes can be electrolytically refined by the Dietzel process or by the Moebius or Balback process. In these processes the electrolyte is a copper-silver nitrate solution, and while they differ in details of arrangement, their efficiency is uniform and extraordinarily high.

U. S. Geological Survey Office at Denver

At Denver, Colo., the U. S. Geological Survey has opened a permanent branch office to facilitate the transaction of its Western work. This office is not only to provide a base of supplies for the large corps of engineers which the Survey keeps in this field, but is also designed to meet the need of the Western public for a source of information less remote than Washington. The office is located in the Commonwealth building, and for the present is under the direction of R. C. Miles, special disbursing agent.

A supply of copies of the publications available for free distribution will be kept on hand, as well as a complete file of the topographic maps, geologic folios, and other publications of the Survey subject to sale. All of these publications will be open to inspection by persons desiring information concerning the subjects treated. Prospective purchasers of maps and folios will be referred to the nearest sales agent, and the free publications will be distributed in Denver to those making application.

The discontinuance of the Denver office over a decade ago was the occasion of much criticism of the policy of the Survey and the reëstablishment of the office will be appreciated by Western mining interests.

Le Roi, No. 2

The report of this British Columbia company shows that the year ended Sept. 30, 1908, was the most prosperous year that Le Roi No. 2 Company has yet had. There was a profit on working account of £53,053, after writing off £19,795 for depreciation of machinery and plant and mine development. Dividends to the amount of 6s. per share, absorbing £37,800, have been paid.

The ore shipped to the Trail Smelting Works amounted to 29,648 tons, of an average value in gold, silver and copper of $23.60 per ton. The receipts from the smelter were $535,245, or $18.053 per ton. The average value of the ore was, in gold, 0.9597 oz.; silver, 0.691 oz.; copper, 30.705 lb. per ton. The company also obtained a small revenue from its own concentrating plant, which treated 15,044 tons during the period. The cost of stoping, ore sorting, power plant and diamond drilling is stated to have been $3.60 per dry ton of ore mined. Depreciation of machinery and buildings and mine development cost together $1.71 per dry ton, making the total costs $5.31 per ton.

The mine is now being operated down to the 900-ft. level and the main shaft is to be sunk farther. The most important discovery of the year has been the strike of ore by a diamond drill some 320 ft. below the 900-ft. level, which is believed to be the downward continuation of the south vein of the Le Roi, which is now yielding high-grade ore. The consulting engineers say that as this vein is dipping northward into LeRoi No. 2 ground, the importance of this discovery hardly needs emphasizing, its true significance lying in the fact that below about the 1200-ft. horizon of the Josie the above vein will continue to be the property of the Le Roi No. 2 definitely.

During the current year efforts will chiefly be directed to the development of the property in depth in order to open up and render available the ore now proved by the drill to enter the company's ground at a depth of 1200 ft. and beyond.

Practically the entire quicksilver production of California is sold by the Eureka Company, of San Francisco. The producers consign their product to this selling agent, which divides its sales *pro rata* among the consignors. The Eureka Company charges 1 per cent. commission and advances 80 per cent. on consignments, charging 6 per cent. interest for such advances.

Examination of Gold Dredging Properties

Loose Methods of Sampling Frequently Responsible, but Dredge Builders Often Blamed, When Ground Fails to Yield Expected Returns

BY T. S. RUH

Many dredging properties that are offered to investors are owned or held under option by men who know little or nothing about gold dredging. In most cases this property has been old placer ground abandoned years ago, and often the owner or the man whom he has hired to sample the property is a placer miner. In sampling the property, the placer miner will find the pay-streak, take a few pans of dirt and make his calculations from this. For argument, we will say five pans of dirt yield three cents. Then he calculates that it requires 160 pans of dirt to make a cubic yard. Therefore he argues

$$\frac{160 \times 3c.}{5} = 96c.$$

This he knows is exceedingly high, so, to be "conservative," he cuts his estimate in half. The property may be good for dredging, and the gravel may be rich, but it is needless to say that such a test is absolutely worthless.

If the placer miner will sample this ground from top to bottom, he will very likely have 30 pans of dirt and get perhaps 5c. in gold. Further, to make this test a fair one, he should take into consideration that at least 20 per cent. of the gravel has been thrown out as large stones. Therefore, the correct quantity of material would be 30 pans plus 20 per cent. or 36 pans, and the value per cubic yard will be $\frac{160 \times 5c.}{36}$, or 32c., which would be exceedingly rich ground for gold-dredging purposes in California and good ground in many parts of Alaska. However, this test is in no wise reliable, since probably the sampler has not sunk test shafts or pits, but has sampled open cuts made by the placer miners, who followed the best pay-streaks almost by instinct. Therefore he has not taken an average sample; he simply prospected one of the best places in the property.

GOLD DREDGING GROUND NEAR NOME, ALASKA

If the sampler had sunk a few shafts systematically to bedrock, and then sampled from top to bottom, he would have come pretty near knowing what was in the ground. If the ground is so situated that it is impossible to sink shafts on account of water, then the only other method is to have an experienced driller drill and test the ground. It is impossible to emphasize too strongly the word "experienced" in the above sentence. Of course by "experienced," I mean one *experienced in drilling ground for gold dredging purposes.* An oil driller is worse than none at all.

Of course this costs money; and the average person who attempts to start a gold-dredging proposition does not care to put money into the ground for which he can see no good returns. When he has not sufficient money of his own to install the dredge, he gets in touch with someone who has read something about gold dredging, and who thinks that it is an ideal field for investment—which it is when properly exploited.

The Ordinary Investor

Like the man who obtained the ground, these investors know little about gold dredging, and although they may be first-class business men in another particular line, at the same time they "fall down" when it comes to a question of prospecting the property systematically and finding out what is really in the gravel before they go ahead.

The investor perhaps goes half way across the continent to look at a piece of gold-dredging property, and then will see the miner take pans of dirt from the gravel (as previously described), wash the "sample" and see with his own eyes the gold that is obtained. I have not only seen this, but I have also seen the miner in order to demonstrate the richness of the property sweep up a pan of dust and dirt from a road that crossed the property, take this to the creek, pan it and get excellent results. Of course the miner knows that the wind and the rain had blown or washed away the light

material, but it is ten chances to one that the investor does not know this.

I remember one property at which the men who financed it only took a few pan tests and then proceeded to purchase a gold dredge. They claimed that they had prospected the ground in a very thorough and systematic manner, and had about 40 samples of gold in glass tubes to show for their work.

The dredge that they bought was a good machine and one suitable for the ground. However, these investors placed the dredge where they *guessed* they had the best values, and proceeded to make a pit in which the dredge was erected on the same principle as their prospecting, namely—on a cheap basis. Therefore, they provided a very small pit, thinking that a dredge which could handle 2500 yd. per day would have a pit in a couple of days which would be large enough to suit every possible need. But imagine their surprise when the first day of operation passed, and they had not enough tailings to fill a small chicken house. However, there were other surprises in store since it took at least a month to open up the pit so that the dredge was able to work to its full capacity; and it was almost another month before the dredge had dug down to bedrock on which lay 90 per cent. of the gold.

Therefore, considering the lost time that a new dredge naturally consumes in making adjustments, and the fact that the dredge handled the top material which contained little or no gold, there were two months of operation, and the dredge had not paid working expenses.

In such cases as this the ordinary investor begins to feel very uncomfortable, and thinks that he has a gold brick on his hands. He goes to the dredge builder and states that he knows that the gold is in the ground, that he knows that the dredge has handled a considerable quantity of dirt, and that he also knows that he has not got the money in the bank. Therefore, the only deduction left to him is that the dredge does not save the gold.

Further, at the end of 60 days, the final payment owing to the dredge builders and amounting to 10 or 15 per cent. of the purchase price, or on a dredge costing $80,000 not less than $8000 is due. If the dredge has made working expenses, it has done very well, but no doubt the investor has calculated on taking this final payment out of the ground and therefore has not raised any capital to meet this payment.

Since he has not been able to dig this money out of the ground, he naturally argues that the dredge builders are at fault and he is not going to pay this final payment. Although the dredge may be built in strict accordance with the contract and specifications, at the same time he will be able to drum up some trouble real or imaginary, on which to stand off this payment, and he is not open to any sort of argument.

He still thinks that his ground is worth 50c. per cu.yd., where it is not worth 15c.; and even at 15c. per cu.yd., it is an exceedingly fine investment, but since he has not seen even the 15c., or perhaps 6c., for all the output has been consumed by the first two months' pay-roll, he naturally feels loth to put more money into what on the face looks like a failure. However, if the dredge builders are patient, and do not tie up his enterprise, he may work on the next month, and handle say 60,000 cu.yd. with a gross return of $9000, and with a total operating cost of say $2500 to $3000. After this experience the investor becomes a much wiser man.

DREDGING GROUND—WHERE THE OLD MINER STOPPED

Copper Industries of Italy

With the exception of the mines at Montecatini, which yield an ore carrying 20 per cent. copper, the average tenor of the ores produced by the Italian copper mines ranges from 5 to 12 per cent., according to Alfred Greco in *l'Echo des Mines*. In a recent issue he outlines the present state of the copper-mining and consuming industries of Italy.

The most important mines are at Libiola, in Liguria, and at Montecatini, Boccheggiano, Fenice Masselana, Capanne Vecchie, etc., in Tuscany. Cupriferous pyrite is abundant in the neighborhood of the Alps, at Algana, near Novare, at Agordo, near Bellune, and in other parts of Turin. Some of the ore from this district was once used by an electrometallurgical company with a plant at Agordo, but later was employed only for making sulphuric acid. On the northern slope of the Apennines, near Parme and Plaisance, there is an abundance of chalcopyrite, though low in copper.

Until recent years the output of copper in Italy was small, owing to the expensive methods of extraction. The leaching process was introduced in 1880, and first put the industry on an economical basis. The process as applied now consists in crushing, roasting, leaching and electrolytic recovery of the copper. After leaching out the copper sulphate the solution runs into large reserviors and then to electrolytic vats in which the copper is precipitated on cast-iron cathodes, yielding a cement copper containing 80 per cent. Cu. This is then refined in reverberatory furnaces.

The Manhès converting process was first introduced in 1888 by the Compagnie Itallienne Métallurgique de Torreta and electrolytic refining was adopted in 1900 by the same company. A certain amount of foreign raw material is imported, mainly from Coro-Coro, Bolivia, from the Lake Superior district and from Germany. Copper and brass are imported from England, Germany and France. Italy has, however, begun to export copper and brass to Switzerland and Argentina.

The copper industries are now developing on a larger scale, principally under the stimulus of increased naval construction. The most important manufactures are copper and brass seamless tubes, sheets and plates for locomotive fireboxes, bars and wire. There are now five plants for the electrolytic extraction of copper from pyritic ores, two copper refineries, two copper foundries, and six works for shaping and rolling articles in copper and brass.

An American company is reported to be employing 700 men in a mica mine near Kodarina, India, about 250 miles from Calcutta on the East India railway.

Air Economy in Rock Drills

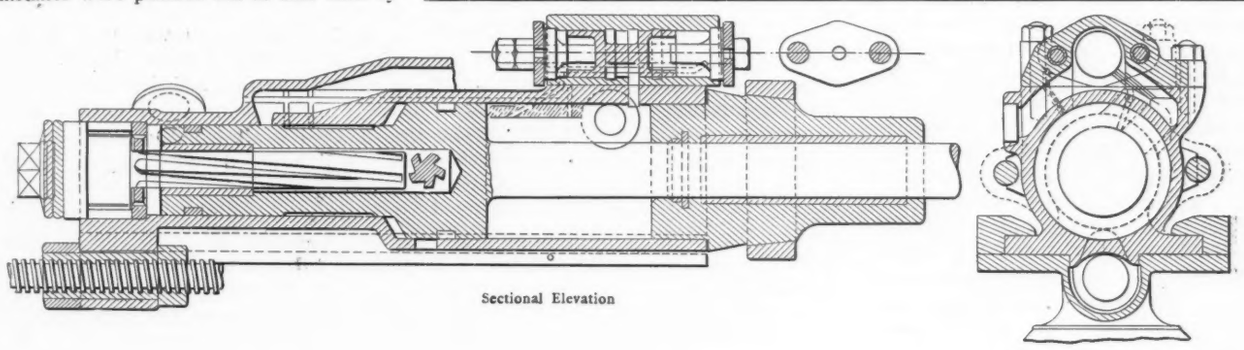
By Alexander West

At a meeting of the Transvaal Institute of Mechanical Engineers some time ago, J. A. MacGeorge contributed an article on "Notes on Small Stope Drills" in which he gave the result of some trials made by him, at the Angelo Deep mine, to ascertain the boring speed and the air consumption of a 3-in. Konomax drill[1] and of a 3¼-in. tappet drill of ordinary design (probably the Little Giant drill). Mr. Mac George states in his paper that the tests were made, the air consumption was measured, and the trials conducted the same as in the City & Surbuban mine tests in 1904. The results are given in a table accompanying his paper showing great care and much labor in its compilation, but unfortunately every mistake made in the City & Suburban trials is repeated so that the test has little practical value. It seems a pity that, since these mistakes were pointed out at that time by several engineers, they should have been made again in these tests. The drills were set up so as to drill a vertical hole in a granite block. The air was furnished from a receiver so that by reading the pressure at the start and the end of the test the amount of air used was calculated. The holes were not started before the test runs began, the steel was not accurately centered, nor were the bits of uniform size; consequently the results have little comparative value. Besides, as the holes were drilled vertical the results would have little practical use at least on the Rand for all the holes except those in shafts are drilled only slightly inclined above or below the horizontal. Although 80 runs were made, the results of only 27 runs were given without any explanation of why the others were thrown out.

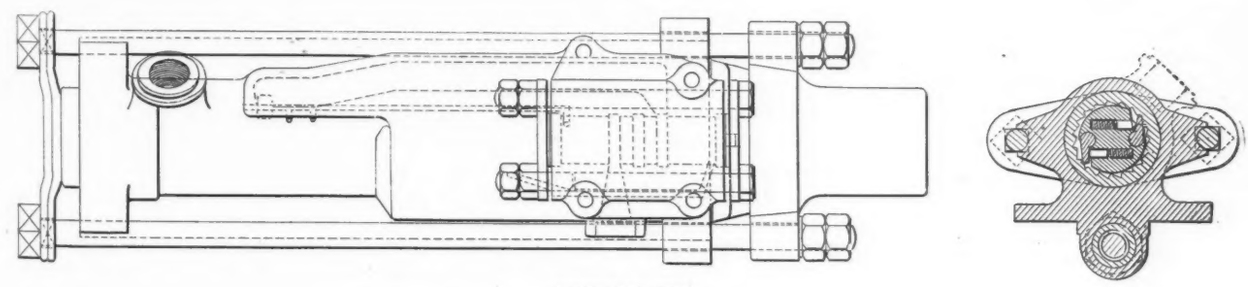
As will be seen from the accompanying table the two drills were tested at air pressures of 80 lb., 70 lb. and 60 lb. per sq.in. The average depth of hole drilled was only 8 in. for the Konomax and 5 in. for the other drill. The results obtained condemn themselves, for they indicate that a machine drills more quickly at 70 and 60 lb. than at 80 lb. per sq.in. The results would also indicate that a hole can be drilled much faster with a 2⅞-in. bit than with a 2⅝-in. bit. The air consumption indicated is also erratic. The only practical result from the test seems to be that it showed that the Konomax drill at greater than 40 lb. per sq.in. can drill almost as fast in free-boring holes as can the best machines of the ordinary type and uses only 60 per cent. as much air.

MAXIMUM AND MINIMUM EFFICIENCY OF THE KONOMAX AND THE 3¼-INCH PISTON DRILL.

Drill Tested.	Test Number.	Gage Pressure.	Total Time of Run.	Depth Drilled.	Size of Drill.	Total Cubic Inches Removed.	Cubic Feet Free Air Consumed.	Rate of Drilling Per Minute.
		Pounds.	Minutes.	Inches.	Inches.	Cubic In.	Cubic Ft.	Inches.
Konomax....	1	80.70	4.433	9.4375	2⅞	48.7	322.6	2.128
Konomax....	26	80.70	4.583	6.8750	2⅞	37.206	317.1	1.50
3¼-in. drill....	30	80.70	3.000	5.375	2⅝	29.440	316.0	1.791
3¼-in. drill....	34	80.70	3.333	4.25	2⅝	22.459	312.4	1.275
Konomax....	2	70.60	4.616	9.0625	2⅞	43.386	317.0	1.963
Konomax....	27	70.60	6.166	7.625	2⅞	38.375	320.9	1.236
3¼-in. drill....	15	70.60	2.666	3.50	2⅝	16.332	326.5	1.312
3¼-in. drill....	31	70.60	3.066	6.375	2⅝	30.134	318.2	2.079
Konomax....	28	60.50	7.75	8.375	2⅞	34.273	336.0	1.080
Konomax....	49	60.50	7.10	11.0	2⅞	40.176	321.4	1.549
3¼-in. drill....	12	60.50	3.816	6.625	2⅝	27.463	341.4	1.736
3¼-in. drill....	16	60.50	2.500	4.0	2⅝	17.490	329.1	1.60



Sectional Elevation



KONOMAX DRILL.

Comparative Value of the Drills in Stoping

But at lower pressures and in difficult holes the ordinary drill can do better and more efficient work than the Konomax, for the increased speed in boring more than counterbalances the increased air consumption. This is shown by a test run by the engineer of the Robinson mine, Mr. McCracken, with holes of an average depth of about 18 in. The holes were drilled at an angle of about 20 deg. from the horizontal and before starting the test to a depth of 7 in. The air pressure was 50 lb. per sq.in., which is about an average of that in use here at many mines. The results showed that an Ingersoll-Sergeant auxiliary-valve machine bored 129.9 in. in 76 min. 21 sec., or 1.708 in. per minute, and the Konomax drilled only 127 in. in 116 min. 18 sec., or only 1.1 in. per minute, the Ingersoll machine thus doing 55 per cent. more work per minute. Tests under working conditions at a certain mine confirm this result. It is known that on this field the Slugger drill can, with high air pressure, drill rock with a smaller consumption of air than any other ordinary drill. This drill has not been compared with the Konomax drill. Owing to low air pressure available the Slugger drill is little used here, however. Fraser & Chalmers are introducing another drill called the Minamax, which is a modified Darlington drill with air used expansively.

[1]The operation of the Konomax drill is described in the Journal, May 23, 1908, p. 1045.

Coal Mining at Hosmer, British Columbia

SPECIAL CORRESPONDENCE

The Hosmer Mines, Ltd., a company closely identified with the Canadian Pacific Railway Company, last December commenced shipments of coal from its mine at Hosmer, in the Crow's Nest Pass district, in southeast Kootenay. The opening of the mine, the erection of buildings, coke ovens and other surface structures, installation of plant and machinery, laying of railway trackage, etc., had been in progress for more than a year previously.

The company owns six sections of coal lands, and two sections of surface on which are located the town of Hosmer and the mine surface works and plant. The known coal seams number 13, varying in dip from 65 to 35 deg., and in thickness from 4 to 30 ft. A main three-compartment tunnel, driven at right angles to the measures, is in about 4500 ft., and has cut nine of the seams. It is expected that the remaining four seams will be intersected within 500 ft. from the present face. The entry is about 600 ft. above the track at Hosmer railway station. Two compartments of the main tunnel are for haulage purposes, and the third for traveling and use as a pipeway. A single compartment parallel tunnel for ventilation is used as a return air course.

Driving of the tunnels was commenced in what are known locally as the Fernie shales, underlying the coal measures, which were reached at 847 ft. The first seam cut is, therefore, the lowest of the series. The coal is bituminous, high in hydrocarbon and consequently an excellent coking as well as steam coal. Much of the product of the mine will be used as fuel for the Canadian Pacific locomotives on its Crow's Nest and other railway lines in the Kootenay and Boundary districts of British Columbia.

The mine is ventilated by a 20x9-ft. Walker fan, driven by a pair of 30x16-in. engines connected to the fan by a rope drive. Steam is supplied by three 80-h.p. boilers. The fan house is of steel and concrete construction and the engine house of brick. Other buildings at the mouth of the mine are concrete lamp house and timekeepers' office, locomotive house for the compressed-air locomotives, and wash houses with baths and lockers for the miners.

The coal is lowered to the level of the tipple by a steam-actuated double-track incline, each track being an independent incline. The mine cars, each of two tons capacity, are lowered in trips of 20 cars; empty cars are hoisted in convenient numbers. Power for haulage is from a pair of 28x48-in. first motion steam engines, with 8-ft. drums fitted with clutches and brakes. Steam for handling these, with reversing gear and throttle, works through cataract cylinders.

Compressed-air locomotives haul the cars from the foot of the incline and dump them into the tipple by means of a cross-over dump. The tipple is equipped with shaking screens to separate the slack for the coke ovens, and picking bands for removal of refuse from the lump coal. Storage bins hold 2600 tons of screened coal, 3000 tons of slack, and 200 tons of refuse. Coal is loaded into closed cars by a box-car loader and into open cars by chutes. The slack is hauled in 7-ton larries to the coke ovens by air locomotives, which also haul the refuse in iron self-dumping cars to the dump.

The coking plant consists of 240 beehive ovens, 12 ft. in diameter and 7 ft. in hight; total capacity about 300 tons of coke per day. Only one-third of the ovens are in use, but others are being started as circumstances permit.

The power-house building is of reinforced concrete with steel floor joists and roof trusses and corrugated-iron roof. Two low-pressure compressors supply air at 100 lb. pressure for rock drills, inside hoisting engines, and other purposes; two high-pressure compressors supply air at 1000 lb. pressure to five compressed-air locomotives. Two 75-h.p. alternating-current generators for electric light for plant and town, are driven by two 125-h.p. steam engines. All the steam engines are fitted with cut-off valves to allow steam to be carried at 120 lb. pressure, cut off early and used expansively. Exhaust steam passes through a 1500-h.p. Hoppes heater, heating the boiler feed water to 200 deg. F. A 10-ton traveling crane facilitates handling of machinery.

The boiler house is of similar wall and roof construction as the power house, but has a cement concrete floor. In it are four 250-h.p. Babcock & Wilcox boilers, with chain-grate stokers, and appliances for the convenient handling of coal and ashes.

The mine buildings in the part of the town reserved for the company's use include a general office, mess-house, three residences for officers, several houses for foremen, large boarding house, 60 houses for miners, and hospital. All buildings are neatly finished and painted, and supplied with water and electric light.

Hosmer lies nearly midway between the Crow's Nest Pass Coal Company's collieries at Coal Creek and Michel, respectively, the mines of which have been in operation for various periods up to 12 years. All development, construction and installation work at the Hosmer mine has been done under the direction of Lewis Stockett, general manager.

The 54-mile double-rope tramway connecting the mines of the Turkestan Coal Mining and Metallurgical Company with Rostowzewo, the nearest station of the Central Asiatic is shortly to be completed.

Report on Cause of Explosion at the Short Creek Mine

The State mine inspectors who made an examination after the explosion at the Short Creek mine of the Birmingham Coal and Iron Company, in Alabama, found that the main entry was ahead of the air, and it is believed that the explosion occurred in what is known as the new slope. The inspectors state that the manner in which the shots were placed, and the quantity of dynamite used in charging the holes leads to the belief that when the shots were fired a large quantity of carbon-monoxide gas was generated and afterward ignited by the flame from one of the shots. It was further stated that the shock of the firing caused fine dust to become suspended in the air, and by being ignited, this element added additional force to the initial explosion. This belief in the activity of dust in this explosion is strengthened by the fact that the explosion was confined to the dry and dusty part of the mine.

Of the sixteen men who were in the mine at the time of the explosion, some were badly burned, and death must have been instantaneous. Other victims were not burned at all, but died from suffocation by inhaling the afterdamp produced by the explosion.

A previous explosion occurred in this mine on October 26, 1908, and six men died of the burns received in this accident. The mine inspector at the time of this first explosion, notified the officials of the coal company that the method of drilling, charging and firing shots in the mine was dangerous, and that all men should be withdrawn from the mine while the shot-firers were exploding the charges. In compliance with the instructions given at the time of the first accident, the mine management has since been busy installing a system of watering the mine, and at the time of the last disaster, the pipe lines were already extended to some parts of the mine, and it is believed that this precaution of sprinkling, prevented the explosion extending over the entire mine, and causing a much larger loss of life. It is stated in conclusion that if former suggestions in regard to the discontinuance of shooting at noon had been complied with, and all shots had been fired at night by certified shot-firers, the probability is that the explosion would not have occurred, and if it had taken place, only one life would have been lost instead of eighteen.

On Dec. 31, 1908, there were 515 blast furnaces standing in Great Britain, of which 310 were in blast and 203 idle. This compares with previous quarters of 1908 as follows: March, 312 in blast; June, 308; September, 301. On Dec. 31, there were five new furnaces under construction, and 70 being relined and repaired.

Welsh Coal Miners Object to Mining Machines

SPECIAL CORRESPONDENCE

For some time past there has been unrest among the coal miners of South Wales owing to disputes as to the rate of wages. At the beginning of March, the situation was so bad that a general strike appeared imminent. Fortunately during the last few days an understanding has resulted between employers and the men at the colliery where the trouble originated, and the situation is for the moment less dangerous. There is, however, a possibility of further trouble taking place in the near future owing to the coming into force on July 1 of the eight-hours bill, which as the title implies, limits the working hours of the men. It is anticipated that when this act comes into place, the employers will demand a reduction in the wage, equivalent to the reduction in the hours worked, a reduction which is likely to be resisted by the men.

The situation is complicated owing to a difference of opinion on the part of the counsel as to the effect of the eight-hours bill on the agreement as regards the rate of wages at present in force. This agreement separates the rate of wages according to the selling price. Having regard to this uncertainty as to the legal position, it is obvious that a definite settlement on the wage question may be difficult to arrange and until some settlement is arrived at the Welsh coal trade will be in a critical position. The coal industry of South Wales is of such great importance that a general strike would be a most serious matter. The district produces somewhere about a fifth of the total coal production of Great Britain and the stoppage of the collieries would paralyze a great many important industries, especially the tinplate and the metallurgical works, besides doing damage to the shipping trade of Cardiff and Swansea.

MINERS REFUSE TO WORK WITH MACHINES

As regards the original cause of the dispute between the owners and the men, some interesting information was given by the chairman of the Powell Duffryn Steam Coal company at the annual meeting of shareholders held during the week. It appears that as far back as October, 1906, the managers of this colliery, which is one of the largest and most uptodate in equipment of all the collieries in South Wales, tried to introduce coal-cutting machinery to work a seam called the Gellideg seam. The men, however, refused to work the new machines. "We tried", says the chairman "over and over again to get the men to come in and test their machines, to test what reasonable men could do in the ordinary way of working in the seam with the coal cutters, but they have, unfortunately, refused and have put every obstacle in the way of the working of the machines." The dispute was then referred to a conciliation board, but it was not until last December that a report was made and then it was to the effect that no agreement with the men could be arrived at. The next step was the decision of the colliery owners to shut down the colliery, and after due notice had been given, the colliery was actually closed on March 1. Fortunately the dispute was of short duration, and, as mentioned above, the men and the management have during the last few days come to terms and work has again been resumed.

With regard to the introduction of coal-cutting machinery, the management of the Powell-Duffryn colliery explains that this method of hewing the coal is necessary for working certain of the seams. Uuless machines are introduced there will be a waste of coal and the life of the colliery will be limited to a much shorter period than would otherwise be the case. The problem is not confined to this colliery but will have to be faced by other mines in the district. The position taken by the miners is extraordinary, especially as it has been shown that with machines, they would earn wages equal to and perhaps in excess of their present wages which are at the rate of $2.40 a day, a wage which according to English standards is a handsome remuneration for a workingman.

The company has been accused of making huge profits and of grinding down the men. The huge profits are not denied, but it is claimed that they have been won more by the sweat of intellect than the sweat of the workman's brow. At all events, some fifteen years ago, the colliery was practically bankrupt and it is due to the skilful way in which it has been managed, to the introduction of electrical equipment, coke ovens, gas engines, and a plant to recover by-products, which installations have made the mine one of the show places among engineering works in Great Britain, that prosperity has been won. That the men are not imposed upon is evident from the wages that are paid.

The refusal to work machines is altogether unreasonable, and the men appear to have recognized the untenable position they have taken up. It is to be hoped that they will be equally reasonable when the time comes to adjust the wage according to the scale of hours for working, laid down statutorily by the eight-hours bill. The shorter hours will chiefly affect the surface hands who have been accustomed to work nine hours. The underground men working on a tonnage basis will probably find that although working shorter hours, they will be able to get out the same tonnage as formerly and consequently will draw the same pay.

It is only fair to add that the situation has been described from the point of view of the employer. There may be other causes than those mentioned that have produced friction between the owners and the men. There is, however, good reason to believe that the refusal of the men to coöperate with the management in the use of machines is a primary cause of the trouble, and on this point there cannot be much divergence of opinion on the part of the public, as to which side is in the right.

Action of Sulphur in a Gas Coal *

In a general way, about 60 per cent. of the sulphur in coal remains behind in the coke. The amount of gas per long ton of an ordinary Westmoreland gas coal is about 10,750 cu.ft., so that where this coal contains 1.5 per cent. of sulphur we have 0.6 per cent., or 13.44 lb. of sulphur leaving the retorts from one ton of coal. A portion of this passes into the tar, probably over 2 lb. to each ton of coal, leaving in the neighborhood of 11 lb. of sulphur to pass on with the gas. This would give 720 grains per 100 cubic feet.

The great mass of the sulphur leaving the retorts with the gas goes in the form of hydrogen sulphide, the percentage of the sulphur in this form being between 90 and 95 per cent. of the total. The rest is in gaseous sulphur compounds of which the most important is carbon bisulphide. Not all of the so-called sulphur compounds are accounted for by the carbon bisulphide, but the exact constitution of those which remain is by no means certain. Between 80 and 90 per cent. of the sulphur occurs as carbon bisulphide.

The total amount of sulphur which is driven off from the coal is but little affected by the temperature of carbonization, but the form in which this sulphur is in the gas may be profoundly affected by the retort temperature. In a general way as the retort temperature is raised there will be produced more sulphur compounds and less hydrogen sulphide. This has been ascribed to the passage of the sulphur containing gases over the bed of very hot coke, in which passage more than the normal amount of sulphur combines with the carbon to form carbon bisulphide. It is believed by some that the sulphur from the coal is first given off as hydrogen sulphide and that all of the carbon bisulphide formed is a result of the subsequent reaction of the hydrogen sulphide with carbon at a high temperature, the reaction being as follows:

$$2H_2S + C = CS_2 + 2H_2.$$

It may, therefore, happen that in the effort to obtain the maximum yield of gas, and, therefore, economy in the production, an abnormal amount of sulphur compounds is formed.

*Abstract of a report by A. D. Little, chemical engineer, Boston, Mass.

The Wolf-Bohres Electric Safety Lamp*

By R. Cremer

The Wolf-Bohres electric safety lamp, fitted with an osram lamp made especially for the purpose, is supplied according to two designs: one arranged to throw the light downward and the other upward. The osram glow lamp will give an equal light, while using slightly more than half the electrical energy required by a carbon lamp. The lamp is fitted with a single-cell accumulator, affording the advantage of a considerable reduction of the weight of the lamp and a more simple treatment of the accumulator. The average length of burning of a 2-volt osram lamp is 600 to 800 hours, against scarcely 100 hours for a 4-volt carbon lamp.

The lamp is fixed in a strong, air-tight glass globe, mounted on the top of, or below, the accumulator, and accessible from all sides. The pure air inclosed between the glass globe and the glow lamp becomes heated by the burning lamp, and its pressure is thereby increased. Should the glass globe be smashed and the glow lamp injured, then the expanded heated air drives back the outer air of the mine, and will at the same time rush into the vacuum of the lamp, causing the filament of the lamp to be instantaneously destroyed. The circuit is thereby interrupted, and the glow lamp extinguished, before an explosive atmosphere has time to enter and to reach the light. Numerous tests made in explosible mixtures have shown that this lamp is safe, under all known conditions prevailing in mines.

The lamp is closed by means of a magnetic lock, which prevents unlawful opening and thereby producing sparks at the contacts. The top and bottom parts of the lamp are connected by slots and projections; and electric contact is formed by sliding two broad spring plates over the contact bridges of the accumulator. The contacts consist of a metal alloy, on which diluted sulphuric acid has a small and slow effect. The opening of the lamp is effected by withdrawing the iron-locking bolt by means of a magnet.

Description of Accumulator

The single-cell accumulator is inclosed in a celluloid case. The case fits loosely into the lamp body and is easily removed and replaced. The leads to the contact pieces are bedded in and are acidproof. The filling opening is fitted with a three-chambered screw-closing device, allowing any gas developed to escape, but preventing any acid from flowing out when the lamp is held in inclined positions.

The accumulator is connected up to a simple charging device by plugs. The glow lamp is fed by the accumulator and glows for a period of 12 hours per charge, yielding a light varying from 1 to 2 c.-p. The lamp is 10½ in. in hight and weighs, complete, about 4 lb. It is rectangular in shape, and is incased in a tinned sheet-steel body coated with acid-proof paint.

*Abstract of a paper read before the North of England Institute of Mining Engineers.

Electric Colliery Winding in England

By T. Hinton*

The views of English engineers on the subject of electrical winding in coal mines may interest American readers. Several distressing accidents involving losses of life have recently occurred in British collieries during the hoisting of men in the shaft. Taking into consideration the conditions, including the depth of the pit, the high speed of the winding and the fact that the cages pass each other in the shaft with but little room between them, it is wonderful that serious accidents are not more common. As it is, they are frequent enough in England, and of a sufficiently serious character, to justify inquiry into the general methods of winding in use in English mines, as compared with the continental practice. The first great difference is that in England, steam engines are almost entirely used for winding, whereas in other European countries, electric power is much more generally used, both for winding and for all other colliery work.

A few electrical-winding engines are at work in Great Britain, and others are now being installed at new mines in South Wales and other districts; however, on the whole, mining engineers in England are unwilling to make any change from their hitherto prevailing practice. This is not due to the want of information and experience, for English mining engineers have repeatedly paid visits in large parties to the continent to see some of the many electrical-winding plants in use in other European countries. Nothing but praise has been heard from them on their return, but with an exception here and there, nothing farther is done. On the continent on the other hand, almost all the new mines of importance are electrically equipped throughout.

Advantage of Electrical Hoisting

The principal advantage of electrical winding lies in the ease and certainty of control. Steam-winding engines are big, powerful machines, with heavy moving parts, difficult to control. The speed of the engine being low, the cylinders have to be large in diameter in order to develop the power required. Furthermore, in consequence of the slow speed, there is a great variation in the angular velocity of the cranks, and the drum has a varying turning movement, which causes unsteadiness in the ropes. The control of the engine is both difficult and laborious. The driver has a throttle valve, a reversing lever, and a foot brake, all with large and heavy levers to work, and he is kept hard at it for most of his time. The safety of the winding depends entirely on the driver, for no mechanical control gear has been devised efficient enough to be generally adopted. The engineer has to watch the depth indicator, listen to the bell, and work the levers controlling the engine, accordingly.

The engine driver uses his reversing gear as a brake and thus reduces the complication to some extent. Electrical-winding gear, on the other hand, is simple and easy to control. Control is affected by dealing, not with heavy currents in the armatures of the winding motors, but with the small exciting current of the generator field. Dealing with small currents of low voltage, the control gear is light and easily manipulated. Only two small levers are needed, one controlling the winding motor and the other the brake. The direction of the winding is determined by the driver's pulling the control lever either toward, or away from him.

The brake lever and the control lever are interlocked, so that the brakes are released when the winder is started, and they are applied again when the current is shut off. For hoisting men, when a lower speed should be employed than for coal, there is a device which automatically makes it impossible for the driver to exceed a certain speed. Furthermore, a combined depth indicator and automatic safety gear is employed, which prevents the driver from starting too quickly. This device also will automaticaly bring the control lever to the "off" position and will apply the brakes, should the driver by some mischance omit to do so at the end of the wind.

Special Emergency Brake

A special emergency brake is also used, worked by air pressure, which holds the brakes off as long as all is right. Should the pressure fail or the bank be overrun, the emergency brake is automatically applied and at the same time the current is cut off from the winding motor. The certainty and safety of this gear does not depend on electricity, for as long as the electrical equipment is in perfect order, the winding gear can be controlled in the ordinary way. However, should anything go wrong, for instance, the supply of current fail, or should the driver lose his nerve or fall ill, the emergency brake would work at once. It cannot fail, for the power which holds it off is gone and the brake is applied by the force of gravity.

The electrical-winding gear usually consists of a motor generator fitted with a heavy flywheel and one or two motors directly coupled to the drum shaft. With

*87 Atlantic Chambers, Manchester, Eng.

lost, but with the electrical gear much of it is saved, as the power used for acceleration at the beginning of the wind is largely regained during braking. During braking, the winding motor acts as a generator, absorbing the power given out by the moving masses during retardation, and reconverting it into power, which is stored in the flywheel of the motor generator.

Electrical winding is perfectly safe and reliable, but it is somewhat expensive in its first cost. The steam-winding engine has worked satisfactorily for many years, and the accidents have been comparatively few. The English colliery engineers and owners whose pits are equipped with the best modern steam-winding engines, cannot reasonably be expected to discard a valuable plant, unless some special circumstances warrant their doing so, but in the case of new mines, especially where electricity is to be largely used for other purposes, it will pay coal companies to adopt elctrical driving throughout.

Mine Explosions as Related to Earthquakes

By W. A. Spalding*

Supplementing my article published in the Journal, Feb. 20, 1909, page 411, I take the liberty of sending an additional list of coincidences and close approximations of earthquakes and mine explosions, covering the time from July 3, 1908, to March 2, 1909.

In those eight months I note 13 striking cases; four actual coincidences; five approximations within one day, and four approximations within a few days.

SUPPLEMENTAL LIST OF COINCIDENCES AND CLOSE APPROXIMATIONS—EARTHQUAKES AND MINE EXPLOSIONS.

1908.	
July 2—Explosion Rikovsky mine, Russia; 214 killed.	July 3—Earthquake, lower Mexico.
	July 3—Earthquake, southern California.
July 15—Explosion, Pottsville, Penn.; 7 killed.	July 16—Severe earthquake, Chile.
Aug. 3—Mine explosion, Shenandoah, Penn.	Aug. 3—Destructive earthquake, Constantine, Algeria.
Aug. 18—Explosion, Maypole colliery, Eng.; 76 killed.	Aug. 18—Severe earthquake, Eureka, Cal.
Sept. 8—Dickson City, Penn.	Sept. 4, 5—Earthquake, Hawaii.
Nov. 12—Explosion, Badbod coal mine, Westphalia; 322 killed.	Nov. 6—Violent earthquake, Plaren, Germany.
	Nov. 7—Moderate shock, Sabetha, Kan.
Nov. 17—Explosion, Birmingham, Ala.	Nov. 12—Earthquakes in Missouri and in Belgium.
Nov. 28—Explosion, Marianna mine, Penn.; 142 killed.	Nov. 28—Earthquake, Boston.
Dec. 23—Explosions at Trinidad, Colo., and West Brunswick, Eng.	Dec. 21—Two shocks, Montana.
Dec. 29—Explosion, Lick Branch Colliery, W. Va.; 50 killed.	Dec. 28—Great earthquake, Sicily and southern Italy.
1909.	
Jan. 10—Explosion, Zeigler, Ill.; 25 killed.	Jan. 8—Earthquake shock, Messina.
	Jan. 8—Earthquake, western Mexico.
	Jan. 8—Earthquake, Tacoma, Wash.
Jan. 12—Explosion, Lick Branch, W. Va.; 150 killed.	Jan. 11, 12—Three earthquakes recorded at Washington, D. C. Earthquakes in Vancouver, B. C.; Washington and Mexico.
Jan. 14—Explosion, Vizprin, Hungary, 61 killed.	Jan. 13—Northern Italy severely shaken.
Jan. 19—Explosion, Stone Canyon mine, San Louis Obispo Co., Cal.	Jan. 19—Heavy earthquake, Asia Minor.
	Jan. 20—Mt. Colima, Mex.; violent.
	Jan. 20—Earthquake, Smyrna.
	Jan. 20—Earthquake, Sicily.
	Jan. 20—Volcano Laguas, P.I.; active.
Jan. 25—Explosion, Merchants Coal Co., Boswell, Penn.	Jan. 23—Destructive earthquake, western Persia.
Jan. 27—Explosion, Morrissey, B. C., Can.	
Feb. 1—Explosion, Short Creek mines, Ala.; 17 killed.	Feb. 1—Earthquake shocks, Montreal, St. Petersburg and Messina.
	Feb. 2—Slight earthquake, Owensville, Indiana.
	Feb. 2—Severe earthquake, Saghalien Island.
	Feb. 3—Slight earthquake, Montreal.
	Feb. 9—Heavy shock registered at Naples.
Feb. 9—Explosion, Catherine mine, near Yuzovka, Russia.	Feb. 9—Earthquake and eruption at Colima, Mex.
Feb. 16—Explosion, Stanley mine, Newcastle, Eng.; 168 killed.	Feb. 14—Earthquake, Reggio, Sicily.
	Feb. 16—Heavy earthquake, Turkey.
	Feb. 16—Earthquake, Budapest.
Mar. 2—Explosion, South Creek Slope colliery, Port Griffith, Penn.; 2 killed.	Mar. 2—Fresh Outbreak, Colima, Mex. New crater formed. Shocks southeastern Mexico.

*Los Angeles, Cal.

Estimation of Ash in Coke

By Harley E. Hooper*

Some time ago when conducting some tests of coke ovens, I was considerably puzzled by the fact that the ratio of the ash in the coke produced, did not correspond to that in the coal charged into the ovens.

Taking a simple example: Ten tons of coal carrying 5.5 per cent. of ash, was charged in. This produced six tons of coke which, according to the ratio, should have carried 9.17 per cent. of ash, but on analyzing, a result of 11.1 per cent. was obtained. The sample was re-assayed, but practically the same result was obtained. The accuracy of the sampling was then suspected, but a more careful sampling revealed no difference. The columns of coke (beehive) were then sampled in section, but the total gave, approximately, the same discrepancy. Some coke formed in the laboratory way from the same coal, showed a discrepancy, but not to the same extent as that formed on a practical scale.

It was then noticed that the color of the ash from the practical test was darker than that from the laboratory, and this the steam-winding engine the work done in accelerating and retarding the load is latter was again darker than the coal ash. An analysis revealed far more iron and less silica in the ash from the coke than that from the coal; and this and other considerations led me to suspect iron added, through the abrasive action of the coke on the grinding plate. This latter was the ordinary cast-iron plate as used in most laboratories.

A small sample crushed down in a wedge-wood mortar returned, approximately, the calculated ratio of ash, but this method of grinding was out of the question with the size of the samples required to give an accurate coke-oven test.

Withdrawal of the iron from the muller-ground sample by means of a magnet was then tried, but owing to the formation of magnetic oxide of iron in the water quenching of the coke, according to the equation

$$6\,FeS + 6\,H_2O + O_2 = 2\,Fe_3O_4 + 6\,H_2S,$$

this later was withdrawn as well, and returned a low result.

Estimates of Extraction of Iron in Coke and Coal

A series of estimations were then made, of the iron in the coke and coal extracted by hydrochloric acid. These results are given below and show clearly that the iron was introduced through abrasion:

Sample.	Crushed to:	Iron, Per Cent.	Equivalent to Fe_2O_3, Per Cent.
Coal	40 mesh	0.107	0.153
Coal	80 mesh	0.121	0.173
Coke (laboratory)	40 mesh	0.86	1.23
Coke (laboratory)	80 mesh	0.98	1.40
Coke (oven)	40 mesh	1.13	1.61
Coke (oven)	80 mesh	1.37	1.96

These figures would, of course, be slightly high, owing to traces of iron oxides (soluble in hydrochloric acid) originally contained in the samples, but judging from the first estimation 0.1 per cent. would more than cover that amount.

The method finally adopted was to crush the coke in the ordinary manner and assay it for *a* ash, and *b* ferric oxide extracted by hydrochloric acid. The percentage of original soluble oxides of iron in the ash had been determined a number of times previously on small samples ground in a wedge-wood mortar, and since it averaged about 3 per cent. (of the ash), this figure, being a minor factor, was used.

An example will serve best to show the method of calculating the result:

Data.

Total ash, got by ignition of coke	10 per cent.	(of the coke)
Ferric oxide extracted by HCL	2 per cent.	(of the coke)
Oxides of iron (originally) in ash	3 per cent.	(of the ash)

Let X = the true content.

then $X = 8 + \frac{3}{100}$ of X

or $X - \frac{3X}{100} = 8$

$X = 8.24.$

From the above it will be seen that in the usual methods of estimating ash in coke an error of about 2 per cent. is incurred and this when dealing in coke in large quantities is a serious item.

*General manager, Maoriland Copper Company, Richmond, Nelson, N. Z.

Impressions of a New Ontario Camp—Gowganda

The Silver Minerals Resemble Those of Cobalt but the Veins Occur in Diabase and Not in the Huronian Rocks as at Cobalt

BY H. E. WEST*

That the Cobalt silver mines are now so well known to the mining world is largely due to the railroad facilities connecting it with the several important cities of eastern Canada and the United States. The more recently discovered "Montreal River section," owing to the lack of such railroad communication, is correspondingly less familiar. Particularly is this true of the western section known as Gowganda, which until the first month of the present year was inaccessible except by the canoe route in summer—70 miles from Elk lake, with 18 portages—or in winter over a forest trail 34 miles in length.

The important discoveries by Mann and Reeves were made in the early days of August, 1908. In September there was a rush by way of the Montreal river, when much of the ground in the Gowganda district proper was staked. My acquaintance with Gowganda was made about the middle of December, 1908, when, with a party of eight we made the trip from Elk lake over the newly cut road as far as Long Point, thence by toboggan and "pack-sack" over the unbroken and timber strewn trails to the shores of Gowganda lake.

Difficulties of the Trail

This little journey occupied one week, as we were heavily laden, and the rough portages necessitated unloading the toboggans, packing the freight, doubling back, etc., so that there were days when four miles seemed a fair day's work, and all hands were glad to make camp. At that time there was no provision for shelter on the road, and each night the tent had to be pitched and camp made, an operation, taken together with packing each morning, which consumed a large portion of the short winter's day. We arrived at Gowganda on Dec. 16, and camp was made on the shore of the northwest arm east of the Mann claim.

The impressions of the trail and of our first days at Gowganda will never be effaced from my memory. Our little party seemed alone in its human activities and all around the lake the dark, pine forest crowded to the shore. Not a sound was heard, nor was the welcome smoke of any camp fire seen save our own. The place seemed deserted and lifeless, which for a camp so much in popular favor as Gowganda caused the inevitable early impressions that the district had been much overrated. Occasionally men were visible in the distance, strung out in Indian file across the lake, leaving to spend Christmas outside and looking for all the world like a flock of homing geese against the wintry sky.

On further investigation of the neighboring woods, some men were encountered in isolated camps, but there were comparatively few who spent their 1908 Christmas at Gowganda. What men were coming into the district were heading northward for Obuskong and Diabase lake, while our party went south visiting Hanging Stone, Frying Pan and Elk-Horn lakes. The slush on the ice of this latter lake was so thick that it became impossible to drag our toboggans. We could make but one mile an hour and that with killing work, so that finally the attempt to reach Duncan lake, 25 miles farther by the lake route, was abandoned. A permanent camp was established and others of the party returned for fresh provisions.

It was apparent that no considerable number of men could operate for any period far from their base of supplies, since the carrying power of the party was limited to the capacity of the individuals, the transported supplies lasting two or three weeks at most. This meant the packing in of supplies of consumption rather than those of utility, such as dynamite, steel, etc., thus accounting for the slight development accomplished, or that was in progress at that time.

Wagon Road Opened

When the government road was pushed through to Gowganda lake—and this important feature was accelerated by the energetic action of the several claim holders, whose roads antedated the completion of the government road a month or six weeks—teams were able to haul in supplies in quantities, and it was not long before the entire camp took an entirely different aspect. Labor became more plentiful, clearings were made, log houses put up, roads constructed and camps established. Development, of which practically none had been done previously, was no longer neglected and several shafts were started on promising properties.

Since the opening of the road early in the present year the main object has been to freight in supplies and machinery, so that active work might be instituted and carried on throughout the summer. To this end the leading properties are endeavoring to accumulate a stock of supplies sufficient for nine months—until winter roads are again available. It must be understood that the present road is suitable for winter travel only, as a considerable portion of the lake has been utilized for this route. The matter of a suitable summer road, though under discussion, is still undecided.

Transportation Problem

The question of railroad connections with both Charlton, the present head of the T. & N. O. railroad, and Sellwood, on the Canadian Northern Ontario railroad, is being actively canvassed. There is no question that railroad connection is essential to the opening up of the mines of the Montreal River section. In fact, without a railroad to bring in supplies and transport ore, there is not a mine that can hope to make payable returns.

That road transportation cannot cope with the problem is proven by the fact that, although there were over 600 teams between the railroad at Charlton and Gowganda, no surplus of supplies has yet been collected at the latter point. The demand of the host of prospectors in the woods estimated at 5000 men is equal to the supply of provisions the two roads are capable of delivering. Machinery and mining supplies are moreover engaging a considerable proportion of the available teams. The freight rate from Charlton to Elk lake, a distance of 24 miles, which was until recently 50 to 60c. per 100 lb., has been raised to 75c. or $1. From Elk lake to Gowganda it is $3 per 100 lb. for a distance of 34 miles.

Leaving the question of transportation, it may be of interest to pay some attention to the claims of Gowganda as a mining district. My personal experience of Gowganda, up to March of this year, has been confined entirely to the southern half, and from Gowganda to Elk Horn lakes. As this area, about two miles square, comprises all the better known properties, it will be a guide in estimating the probabilities of this new mining camp as a future producer of silver.

From the Boyd-Gordon on the north to the Bartlett mine on the south, all of the properties on the "ridge" may be included in the prospective list of Gowganda's silver producers. These "ridge" properties include the Mann, the Reeves-Dobie, and the Welsh claims. The Milne, Armstrong Fraction and Crawford claims abutting the "ridge" may also be considered of prospective value. All these properties lie either entirely or partly across the ridge of diabase composing the "backbone" of the peninsula.

*Mining engineer, El Oro, Mexico.

Rock Formation at Gowganda

The rock formation of Gowganda is not dissimilar to that of Cobalt. There are the same coarse conglomerates, angular clastic agglomerates, slate-graywacke and quartzite, all members of the Huronian series, with diabase appearing at the surface in narrow bands, usually striking northwest-southeast. From the frequent change, in parts, of diabase and slate it is not unlikely that diabase may be found the underlying rock in several areas now covered by members of the Huronian series. In Cobalt, this underlying or fundamental rock is Keewatin. At Gowganda I should judge a considerable area of the surface Huronian rock to be underlaid with the intruded diabase. In other words, that in parts the Huronian rocks are superficial and at moderate depth the fundamental rock will be exposed—be that what it may. Rocks of the Keewatin horizon do not appear conspicuous in any part and are absent in the southern half of the district.

Best Veins in Diabase

The striking point of dissimilarity between the Cobalt and Gowganda districts lies in the fact that in the former the conglomerates and graywacke-slates of the Huronian series contain the majority of the proven veins. At Gowganda no deposits of merit have yet been proven except in the diabase rock. Just why this radical distinction occurs—if this be a correct interpretation of surface phonomena—is difficult of comprehension.

So far as proven then the diabase is the favored formation; the coarser crystalline variety, gabbro, is prevalent, in which occur the aplite veins or dikes for which the entire Montreal River section is noted. Aplite, in the textbooks given as a mica-less or one mica granite (muscovite), is here perhaps more correctly regarded as a later intrusion of the same magma as the diabase, by differentiation, filling the secondary fissures in the diabase with a light colored rock usually pink from a contained feldspar, from which the darker silicates of the diabase are lacking. Feldspar, quartz and calcite are the main constituents, with "aplitic" texture, forming what is termed the diabase-pegmatite.

The Vein System

Throughout the district the vein system is marked by two sets existing at right angles to each other, one set of veins striking roughly north-south, with the other east-west. More correctly speaking, however, these veins are usually east of north, or approximately northeast, with the other set south of east, or southeast. At the surface in several of the properties mentioned, veins carrying metallic silver are observed. Such veins are in no instance more than a few inches wide. Usually 1 to 2 in. represent the rich silver portion, although between the walls the fissure may measure from 10 to 12 in. The remaining portion carries a certain amount of leaf silver and usually is characterized by "cobalt-bloom." This enrichment may extend also into the walls for a few inches.

So far as developed, there exist no duplicates of the massive native silver veins such as are visible even today at Cobalt, at the Lawson, La Rose, of Temiskaming and Hudson Bay properties. Of course, these latter are phenomena not often met in any part of the world, and it is not necessary that such should exist at Gowganda. There is sufficient evidence of an encouraging nature already exposed. Massive smaltite and niccolite occur, but usually the richer silver veins are sparsely accompanied with these accessory minerals.

The Various Prospects

The deepest development thus far at Gowganda is in the shaft on the Boyd-Gordon claim. This shaft is down about 45 ft. In it are exposed three veins, one of which for an inch or two in width carried native silver. Smaltite is in considerable evidence in the other veins with small silver content. One hundred bags of ore containing from 3000 to 6000 oz. of silver per ton have been bagged during the sinking of this shaft. The shaft is in diabase.

On the Mann claim two shafts are being sunk, the northern one down about 12 ft. and the southern about 25 ft. deep. A vein from 1 to 3 in. wide, carrying in places considerable native silver, is seen against the north wall. All these veins are members of the east-west type. In the Reeves-Dobie claim, except for the credible report of rich surface showing, with some chunks of metallic silver to prove the assertions extant, nothing is at present open to inspection. The Welsh property has, it is claimed, some 50 veins and fractures in the two claims of 70 acres; two of these veins carrying native silver. These claims are trenched at the surface extensively, with a few pits sunk on the first exposure.

Narrow Veins with Enriched Wall Rock

In the four southern blocks of the Bartlett claim exist some excellent surface showings of native silver. I remember one particularly that I saw in December last that was exposed for about 50 ft. In places the vein was 12 in. between the diabase walls, the silver streak averaging from 1 to 2 inches in width carrying probably 3000 to 6000 oz. per ton of ore, the balance of the vein containing leaf silver. The walls doubtless contain leaf silver for a few inches, or possibly a foot from the silver streak.

To the west the vein was seen cutting through the polished glaciated surface of a diabase bluff. Six feet to the south was an intrusive aplite vein about 18 in. wide. Joining the two veins were cracks or joints in the diabase, about ⅛ in. wide and filled with sheets of silver. The appearance was striking and up to the present the most promising exposure I have seen at Gowganda.

All veins are not of these narrow dimensions. In one of the Crawford blocks running into Crawford lake is a vein of calcite fully 6 ft. wide. Beyond a sparse occurrence of chalcopyrite and galena the vein at the surface is thus far barren. It is in the narrow veins with the enriched wall rock that the payable deposits are found.

Development Necessary

With the numerous veins exposed, several of which show native silver in mass and leaf form, all the claims situated on the "ridge," or touching thereon may be considered as possessing bright prospects of being converted into payable mines. Depth is required to prove the persistence of these silver veins in the diabase and depth is that factor, more than all else, that only time and work discloses.

The fact that veins "tight" at the surface open out encouragingly a few feet below proves nothing conclusively. At 100- or 200-ft. depth, facts as to vein enrichment begin to be ascertained. Indications at the surface are favorable. If these are confirmed with developments at moderate depths, profitable silver production at Gowganda is assured.

In addition to the "ridge," another area of diabase extends south of Gordon lake, westward to the Elk Horn lake. Here also are some promising properties in prospect. The Gowganda section possesses many claims on which strong and persistent veins are disclosed. The summer's development, however, is needed to prove just what the pretentions of this section justify. Notable silver discoveries have not been authentically reported up to the present time.

Railroad Connections Essential

Whatever developments may disclose, Gowganda's mines cannot become producers until facilities are obtained to bring in supplies and export ore. Without railroad connections, Gowganda's mines are not capable of profitable production. The mines at most can be developed to the producing stage. This, in most cases, will occupy a year or two's work, and after that period shipments of ore may be expected.

As yet nothing has been determined to solve the much-needed problem of transportation. Schemes are on foot to connect Elk lake with the T. & N. O. railroad at Charlton, and Gowganda with the Canadian Northern Ontario railroad at Sellwood, and also to connect these two centers. Meantime, no definite railroad construction has been decided upon. People criticize the Government's seeming apathy, but many support the conservative view that time is necessary to prove the prospects and justify the building of railroads.

When it is remembered that a large amount of money is being invested in the Montreal river section by capitalists of Canada, America and England, whose calculations are primarily made on obtaining transport facilities (without such it is a difficult matter to ever develop these claims to the producing stage) it seems reasonable for the Government to display no less enterprise, and after a preliminary investigation to energetically provide the means of communication essential to the community.

This argument is further strengthened in view of the considerable revenue the Province of Ontario derives from the numerous phases of the mining industry. The mining community, justly or not, has a decided opinion that many of the sources of revenue are extortions and from the considerable revenue derived it receives an inadequate return.

When a new mining industry is grafted on a province devoted mainly to agricultural and allied interests, it is invariably the case that the mining interests are subordinated to the vested interests. This was amply demonstrated in the early days of Victoria, when the friction between mining and older interests in that colony became so acute that the mining community decided on separation. This movement ended with the deplorable incident of the Eureka stockade—an episode well known to all mining men conversant with Australian history.

Whatever the individual view held on the policy of the Government, I think all mining men who have inspected the Montreal river section will agree that in this section, and especially the Miller and Gowganda districts, are many favorable prospects that promise to become mines. At the same time it is certain that not one of these embryonic mines can become a steady producer of silver without the assistance of the railroad. It would, therefore, seem to be the duty of the Government to provide the means whereby these latent assets can be quickened into life, and increase the silver production of Ontario.

It appears that in the realms of possibility the whole Montreal river section might, within five years, equal the present production of Cobalt, but this must be based on the two assumptions that railroad construction is commenced forthwith and that the development of the mines at depth is not less favorable than at the surface.

According to the government report the estimated number of persons employed in and about the mines of New South Wales during 1908 was 38,780, or 4900 less than in 1907.

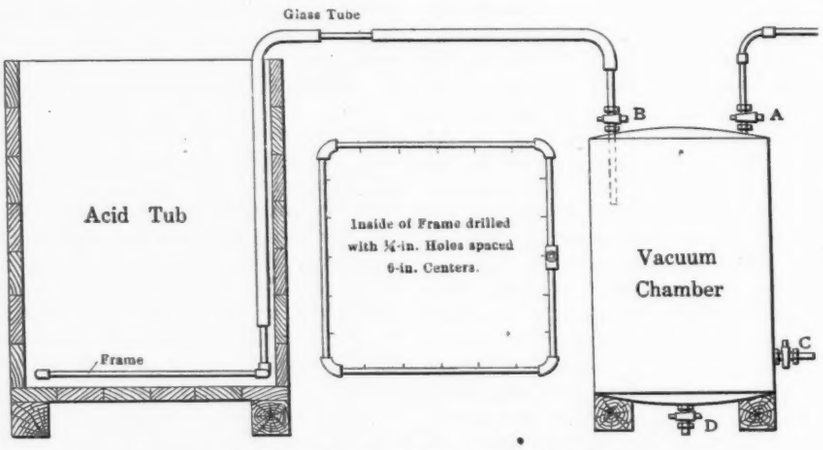
According to *Queen. Gov. Min. Journ.*, the value of the tin and tin ore of New South Wales, obtained during 1908, was £205,447.

Filtering Gold Slime

By Eiler Jensen*

In small cyanide plants where a clean-up press is not provided, the filtering and washing of the gold slime after acid treatment of zinc is generally found to be a slow and tedious process, but the following arrangement can be very cheaply installed. It will save much time in the clean-up, and is, in fact, with small plants, a good substitute for a filter-press. The whole operation of washing and filtering can be done in the acid tub, and consists simply of applying the principle of vacuum filtration to the clean-up. The appliances necessary are a filter frame, a vacuum chamber and a vacuum pump.

The frame is constructed of ¾-in. piping, screwed together in the form of a square, with a T-piece let into one of the sides, to which pipe and hose can be fitted; the sides of the pipes toward the center have ¼-in. holes drilled every 6 inches. A filter cloth to fit the frame is made of two pieces of good canvas or cotton duck, between which are two layers of coarsely woven cocoanut matting. The four layers are all held together by a few rows of stitchings, about 3 in. apart. The cocoanut-mat layers are made so as to fit easily inside the frames, the duck being left large enough so that the top and bottom layers can overlap the frame on opposite sides and can be well sewn together all round. This then forms an efficient cell for filtering solution. The frame is made of such size as to fit the bottom of the acid tub with about 2 in. clearance all round.



APPARATUS FOR FILTERING ZINC PRECIPITATE

The vacuum chamber can be conveniently made from a sulphuric-acid drum, fitted with pipe connections as in an accompanying illustration. *A* is a pipe with cock to vacuum pump; *B*, pipe with cock and hose to filter frame; a cock *C* for running out clear acid solution; this should be placed six inches above the bottom of the drum; *D*, cock in center of bottom for cleaning out drum. Pipe *B* is carried down one foot inside the drum, so as to obviate the carrying over of any of the acid solution through pipe *A* to the vacuum pump. Drums with convex ends should be chosen as they can be thoroughly drained when cleaning out.

After the acid treatment is finished, the tub is filled with water, and the contents well stirred, then after the precipitate has settled, the clear solution is decanted off. The remaining gold sludge is well stirred and the frame is put into the tub, and the cocks to the vacuum chamber and pump are opened. The frame should lie horizontally on the bottom of the tub and remain there until all the liquid is drawn off; it can then be lifted from the bottom and placed upright against the side of the tub while sufficient water is run in for washing. The slime adhering to the frame is scraped off, and, together with the rest of the slime in the bottom of the tub, is thoroughly stirred up with the water. The frame is again laid horizontally on the bottom of the tub and the vacuum cocks are opened as before. One washing in most cases will be ample, but can easily be repeated if insufficient. After the liquid is all drawn off, the vacuum is maintained for a time so as to air-dry the slime as much as possible. The slime is then collected from the frame and from the bottom of the tub; with careful scraping very little need be left on either. What is left can, however, be collected by washing and sponging the tub and frame with about half a bucketful of water. The washings can then either be filtered through a small calico filter, or use may be made of the filter frame, by laying it down flat and, with the vacuum on, slowly pouring the washings upon one side of it; when dry the slime is carefully scraped off. If the filtering is slow with only one frame, there is no reason why two or more should not be used.

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NOTE—Abstract of an article in *Journ.* Chamber of Mines of Western Australia, p. 423, November, 1908.

The Mineral Production of Maryland in 1908

By Wm. Bullock Clark*

The statistics gathered by the State Geological Survey, acting in coöperation with the Division of Mineral Resources of the U. S. Geological Survey in Maryland, show clearly the effect of the business depression arising from the difficulties in the money market during 1908. The depression is especially noticeable in the larger industries; some of the smaller ones, like flint and feldspar, sand and gravel, show a satisfactory increase. The statistics collected to date are practically complete with the exception of a few small operators. The total value for the year is $8,591,817 or about 78 per cent. of the normal annual production.

Coal

The production of coal in 1908 amounted to 3,908,120 long tons, the legal standard in the State, or 4,377,093 short tons valued at $5,116,378. These figures show a decrease of 1,031,726 long tons as compared with the production of 1907 and the value has been correspondingly decreased $1,507,319. This is an unusually heavy reduction in the annual production, representing the lowest valuation since 1901. The average price per ton was the same as in 1907, viz., $1.34 per long ton. The coal from the "Big Vein" or Pittsburg seam of the Georges Creek Valley sold at prices from $1 to $1.80 per long ton, the average being about $1.38.

The relative production of coal from the different seams remains about the same, but there appears to be an increasing interest in and development of the "small veins" as the "Big Vein" coal approaches exhaustion in some of the well known mines. The conditions during 1908 were not favorable to the development of new properties in the small-vein coals.

Building Stone

The building-stone industry suffered less during the depression than the coal on account of the increased use of crushed stone for concrete and road construction. The total value of the stone produced during 1908 was $1,045,880, as compared with $1,555,415 in 1907, or a decrease of $509,535. Much of this decrease is directly due to the completion of the construction of the McCall Ferry Power Company's immense dam across the Susquehanna river. The decrease is only temporary since there is every prospect of a greatly increased production next year from the use of crushed stone in the filtration plant of Baltimore and the State roads system recently inaugurated.

*State geologist, Baltimore, Md.

Clay

The production of clay and clay products during 1908 was considerably less than that for 1907. The total production for the year is valued at $1,452,259, or a decrease of $463,979 from the figures of the preceding year. The production for 1908 is somewhat below that obtaining prior to the marked increased demand resulting from the Baltimore fire. The figures given include the brick, tile, pottery and raw clay.

Lime and Cement

The production of lime and cement during 1908 was almost the same as that for 1907, the lack of change being due to the practical extinction of the natural-cement business and the beginning of operations of a large portland-cement plant near Hagerstown. The lime-burning industry remained unaffected by business depression, the reaction in the lime industry usually occurring a year later than with the other mineral products. The value of the production of lime and cement during 1908 was $332,445 as against $334,316 for 1907.

Sand and Gravel

The production of sand and gravel shows a marked increase over that reported for 1907, which is doubtless due to the continued increase in the use of cement and the consequent demand for these products. Most of the sand sold is obtained from the Coastal Plain deposits or by dredging the tributaries of the Chesapeake. In one instance disintegrated crystalline dolomite is employed with success. The total production for 1908 is valued at $402,966 as against $268,048 for 1907.

Flint and Feldspar

The production of flint and feldspar during 1908 was greater than in 1907 but not as great as that of 1906. The total production for 1908 is valued at $104,563 as against $90,860 for 1907. Of this production feldspar represents two-thirds and quartz one-third. The feldspar output is chiefly in ground form as is also true for the quartz.

Ores

The production of the metalliferous ores in Maryland is so small as to affect but little the State's total mineral output. Gold and copper are found in small quantities and there is generally a small production each year of one or both of these ores. The industries based upon them are, however, not well established and the returns frequently are less than the outlay. The iron ore, on the other hand, has been one of the most important metallic products in the State. With the closing down of the Muirkirk furnace there has been a complete cessation of mining the carbonate ores of the eastern counties. This has been offset in part by some revival in the mining of the brown hematite ores in the Piedmont, especially in Carroll and Frederick counties. Most of the deposits are relatively inaccessible, such ore as is mined being shipped to furnaces in Pennsylvania. The total production of all the ores, gold, copper, iron and mineral paint amounted to only $37,758 in 1908 against $37,767 for the same materials in 1907.

Miscellaneous

Under this heading are included talc, soapstone, diatomaceous earth, or tripoli, mineral waters and marl. The production of mineral waters shows an apparent decrease in quantity and value, due in part to closer inspection of the statistics. The value for 1908 being $75,858 as compared with $110,039. The production of the remaining materials is slightly less than $25,000.

Nipissing Mines Company, Cobalt

The president's report April 20, 1909, shows that the record for 1908 is as follows: Shipments of ore, 3505 tons, of which 702 tons were high-grade ore containing 3155 oz. of silver per ton, with 10.01 per cent. cobalt, 5.48 nickel and 37.69 arsenic. The remaining 2803 tons contained 210 oz. of silver per ton. The total net value of the ore shipped was $1,363,783. The cost of producing silver, per ton of ore, in 1908 was as follows: Operations, $105.46; depreciation at the rate of 24 per cent. on the plants and buildings, $13.03; marketing ore, $51.02; corporation, legal and other expenses, $6.50; less income from rents, etc., $8.10, or a total cost of production, $167.91, which, based on the amount of silver produced, is $0.20715 per ounce.

The exploration work for the year exposed much new ore, and on Jan. 1, 1909, the ore reserves were estimated at $1,078,000. During the year 10,013 ft. of underground work was done through 12 shafts and two tunnels. The company owns 846 acres of land, 383 acres of which have not been prospected. Since Jan. 1 a rich vein has been found in the Fourth of July and No. 64 shafts. The total dividends paid by the company since it began operation four years ago is 44 per cent. on the capital, or $2,640,000.

The report of the United States Steel Corporation for 1908 gives the following figures for the export sales made, in long tons:

	1907.	1908.	Changes.
Pig iron and scrap....	.....	21,898	I. 21,898
Finished steel.....	1,014,014	777,276	D. 236,738
Miscellaneous.....	68	232	I. 164
Total.....	1,014,082	799,406	D. 214,676

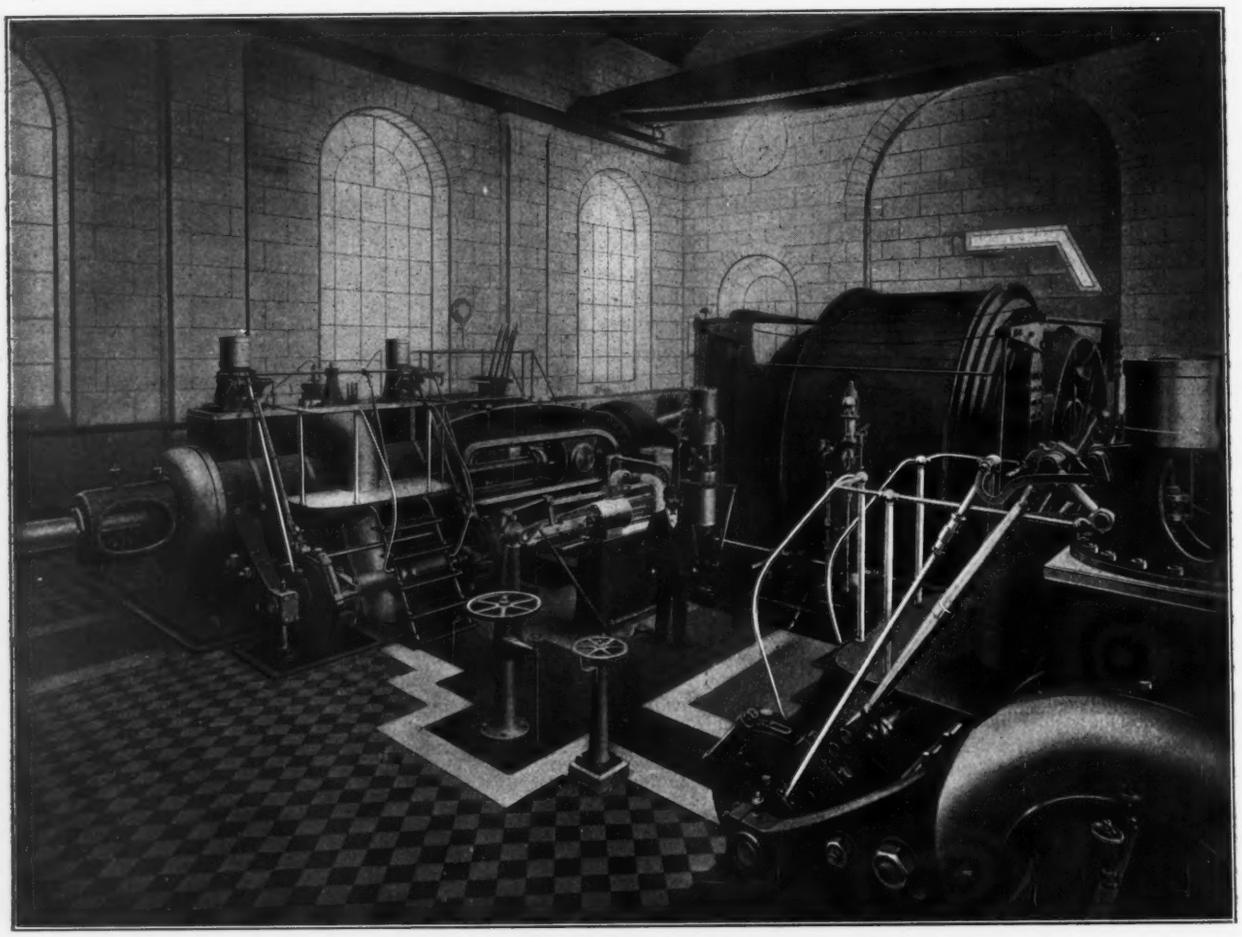
Comparing these with the total exports, we find that the Steel Corporation in 1908 furnished 87 per cent. of the total exports of finished steel, and 47 per cent. of the pig-iron exports.

Three Thousand Horse Power Winding Engine

Details of a Coupled High Pressure Type to Operate at 150 Lb. Steam Pressure and 50 Deg. Superheat; Safety Gear of the Whitmore Type

BY J. B. VAN BRUSSEL*

The winding-engine plant illustrated herewith has recently been installed in an English colliery. The engine is of the coupled high-pressure type, each cylinder being 36 in. diameter and 72 in. stroke. The cylinders are joined directly to the engine-bored guides and under the piston rods are supporting brackets. The back covers are easily removable for the purpose of examining the pistons. Provision is also made on the supporting feet of the cylinders to allow for expansion to take place in a straight line. To make this possible the holding-down bolts of the cylinders are separate from the foundation bolts. The cylinders are constructed for a working pressure of 150 lb. and superheat of 50 deg. Fahrenheit. The cylinder body and steam chest are well protected with nonconducting material and covered with blue-steel plates secured by polished bands.



A 3000-HORSEPOWER WINDING ENGINE AT AN ENGLISH COLLIERY

The valves are lifted and released by levers actuated by eccentrics driven from the lay shaft running the same speed as the engine and parallel to the engine frame. An auxiliary eccentric is placed by the side of each trip lever eccentric to vary the cut-off by means of a cam lever which is also under the control of the governor. The grades of cut-off vary from 0 to 80 per cent., and steam may also be admitted up to 90 per cent. of the stroke when not under control of the governor. The exhaust valves are similar in design to the steam-inlet valves, and are actuated by means of rocking levers worked from the steam eccentric, thus giving a full exhaust under all grades of cut-off. The valves are so placed as to effectively drain the interior of the cylinders and allow the pistons to work with the minimum amount of clearance.

The governor, which is of the static type, is driven by a roller chain from the engine shaft, the governor being coupled to the trip motion by cross-shafts and bevel gearing and so arranged that the reversing hand lever can be left at full gear, the governor automatically varying the steam admission. The governor is so set that the engine speed cannot exceed 50 r.p.m. The reversing is effected from the driver's platform by a hand lever capable of easy movement. This hand lever is connected to the steam-reversing engine with floating lever attachment, in order that the reversing gear may promptly take a position corresponding to the driver's reversing lever.

On the reversing shaft is placed a lever and rod connecting with the governor

*Brussels, Belgium.

transmission shaft, and thus disconnecting the governor from the cut-off gear when reversing. Provision is made to throw the trip gear to full-steam position to enable the steam reversing to be effective even when the engine is running full speed in the opposite direction. A safety gear of the Whitmore type is fitted to this engine, which shuts off steam from the engine and applies the brakes, thus preventing the possibility of overwinding if the attendant fails to shut off steam, or starts the engine in the wrong direction.

A steam separator 3 ft. in diameter by 9 ft. long is placed between the cylinders and is followed by a 12-in. parallel slide valve. The main throttle is placed next this valve and is of the equilibrium type with cast-steel body. The engines are fitted with a most efficient system of drain gear and all the valves and handles are in a convenient position for ease in working.

The winding drum is of the built-up type, with channel-steel arms firmly secured to cast-iron bosses. The form of the groove is such that slipping of ropes is reduced to a minimum. The brake paths are faced with steel plates and arrangements made for adequately ventilating same and keeping cool when running on the brake. The drum is arranged for two ropes, each rope commencing on a flat 13-ft. diameter, then continuing up a slow core to 14 ft. diameter, then running up a spiral to the cylindrical portion of the drum, which is 17 ft. in diameter. The distance between the flanges of the cylindrical portion is 7 ft. 6 in. in the clear.

The brakes are operated by a vertical engine and weights. The brakes are put on by the weights and released by the engine, the engine being fitted with a system of floating levers whereby the position of the piston and consequently the degree of intensity with which the brakes are applied can be varied at will. The position of the piston corresponds to the position of the lever on the driver's platform. The brake engine is also coupled to the overwinding device and, as in the case of the former, the steam is cut off and the weights apply the brakes.

The depth indicator is arranged so that 1 ft. movement of the cages is represented by at least 1 in. of the pointer of the barrel. It is also provided with gong to ring at approved periods before the end of each of such wind. The driver's platform is on the left-hand side of the engine. All the operating levers are here handily arranged for controlling the throttle, reversing, brake engine, drain valves, etc.

The leading dimensions of the engine are: Diameter of cylinder, 36 in.; stroke, 72; diameter of piston rods, 7; diameter of crank bearings, 18; length of crank bearings, 32; diameter of crank pin, 10; length of crank pin, 12; diameter of crank shaft in drum, 22; diameter of gudgeon, 8; length of gudgeon, 12; length of connecting rod, 15 ft.; diameter of connecting rod at ends, 7 and 8 in.; diameter of connecting rod in middle, 9 inches.

The West African Goldfield

The West African goldfield of Gold Coast Colony has been attracting considerable attention in London of late, and the shares of the producing mines, as well as those of companies owning undeveloped properties, have been bought. The Consolidated Goldfields of South Africa Company, Ltd., has given a lead in drawing capital toward this goldfield, which up to the present has given disappointing financial results, by guaranteeing a large amount of money, about £250,000, for opening up new properties. This mark of confidence in the future success of the field has been prompted, it is said, by favorable reports from Walter Broadbridge and J. H. Curle. The results obtained by the producing mines do not call for any great enthusiasm. Although a good deal of gold is produced the dividends have been insignificant. For the last three years 1906, 1907 and 1908, the value of the gold produced has been £877,568, £1,154,885 and £1,186,342 respectively. Last year the Abosso Company alone distributed a dividend. Up to the present the cost of working has been high compared with the Rand; owing partly to the bad climate which causes difficulty in securing efficient management; and partly to the small scale of operations, the largest mill on the field being one of 50 stamps. If the mines can be worked on a larger scale, costs will no doubt be reduced, but to do this a large amount of development work and a considerable outlay are required. The thickness of banket on the West Coast compares unfavorably with the Rand and a far greater footage of development will be required for a given tonnage. Then again the continuity of the West Coast banket as a payable ore deposit is still uncertain. It may be found that the beds are workable only in certain portions, and that in between the reef may be too narrow or too poor to work at a profit.

A map of the West Coast banket area is marked off into blocks much the same as on the Rand and an enthusiastic speculator, who figures out tonnages as on the Rand should bear this point in mind. With increased outputs a reduction in grade may be expected. In examining the statistics of the producing mines, it will be seen that there has been a great falling off in the yield lately compared with the yield obtained at the commencement of operations, a sign that the mines were started on a grade above the average.

Although the field has undoubted possibilities, it would be unwise to look upon it as a second Rand, and those who are finding the money for its further development would do well to concentrate their efforts on the best known portions of the banket.

The Peat Fuel Industry of Canada

A memorandum prepared by the Dominion Superintendent of Mines and presented to the Canadian House of Commons, gives some information relative to the peat-fuel industry of Canada and its possibilities substantially as follows:

The high prices of imported coal in the middle provinces of Canada, the depletion of our forests, together with the increasing value of the forests for other purposes, and the suffering induced on account of scarcity of fuel in recent years consequent upon labor conditions are causes which have again prominently brought forward the question of utilizing peat bogs and lignite deposits for the production of marketable fuel and other purposes.

The estimated area so far reported distributed over the different provinces of the Dominion is 37,000 sq.m. The areas covered by peat bogs in the different provinces are, in square miles: Nova Scotia, 250; Prince Edward Island, 10; New Brunswick, 250; Quebec, 500; Ontario, 10,450; Alberta and Saskatchewan, 25,000. The beds vary from 5 to 10 ft. in depth. Further investigation will undoubtedly prove that this estimate represents but a fraction of the total area available.

Although several attempts have been made to manufacture peat fuel, especially in Ontario, they have, as a rule, resulted in failures, due principally to lack of knowledge. The successful working of peat bogs and manufacture of the raw peat into marketable fuel depend on:

1. The proper classification of the different peat bogs, since the peat occurring in one bog might be suitable for peat-fuel manufacture, while that from another might not.

2. The treatment of the raw material and the apparatus used for its combustion either for domestic or industrial purposes.

These facts, upon which the whole success of the industry depends, can be determined only by experiments carried out on a commercial scale and in an intelligent manner.

In several European countries peat is used largely for domestic and industrial purposes with satisfactory and economical results, and as conditions in Canada are quite as favorable for the manufacture of peat fuel and the use of lignite, there is no reason why, with the employment of proper methods and latest ideas, peat-fuel manufacture and use cannot be successfully introduced into Canada.

The memorandum recommends the establishments of a government testing and experimental plant, where the values of these fuels could be demonstrated and investigated.

Colliery Notes

An explosive mixture of firedamp ignites at a minimum temperature of about 650 deg. C. It must be exposed to this temperature for about 10 sec., however, before ignition takes place.

In one German district where safety lamps are used exclusively, the cylinders of the lamps are now made of a specially patented hard glass. This increases the cost of lamp 40 per cent., but prolongs its life 83 per cent.

In putting down boilers, it is advisable to see that the under strata is dry, and to put in a concrete foundation, covering the length and breadth of the space occupied, not only by the boilers, but also the outside walls forming the house and flues. The best kind of a sludge drift leading away from a boiler house, is built of large earthenware pipes, laid in good concrete.

There is no longer any question that coal dust will explode and damage a mine that is free from gas. One writer has aptly said: "Gas will always bear the relationship to coal dust that the detonator does to the high explosive, even though the latter in each case does most of the damage, and can usually be exploded in the absence of the former."

Coal miners generally believe that blackdamp is any mixture of gases which is heavier than air, non-explosive, extinguishes a lamp, and does not cause any noticeable effect on the miner when mixed with sufficient air to allow a lamp to burn. In investigating this subject it has been found that an atmosphere, which is extinctive to lamps, may be lighter than air. Such a condition may occur when the atmosphere is a mixture of nitrogen and carbon dioxide, in which the quantity of CO_2 is so small, that the mixture is lighter than air. A similar condition will exist if the mixture contains less oxygen than is necessary to support combustion, and a percentage of firedamp above the explosive limit.

One question that often arises is, whether the ventilation of a mine should be maintained even when the pit is not working. In this connection it is always best to see that ventilation is constantly produced, even when the pit is idle. In many countries (England, for instance) the mine laws specifically state that ventilation shall be maintained at all times, unless the mine is abandoned. Any mining man of experience must realize that the policy of constant ventilation is the only sensible plan to adopt. It is always easier, in dealing with a large quantity of gas to remove it little by little, than to try to remove it all in a body. What the blood is to a man as it courses through his body, so is the ventilation to a mine.

When a central rescue station is established to serve a group of collieries, the station should be in direct telephonic communication with every colliery within its radius by means of a private wire to each; the telephonic line between each colliery and the station should be tested daily and the tests recorded in a book at the station where at least one assistant should be continuously on duty. Those who oppose the establishing of rescue stations do so on the ground that prevention is better than cure. Although explosions can be prevented, they continue to occur, and it is certainly wise to spare no reasonable expense in properly equipping such central stations, so that when the unexpected does happen, perhaps hundreds of lives may be saved.

Much care should be observed when electric motors are installed underground. American operators could learn much from observing the practice in continental mines, where the chambers for motors are constructed with water-proof arched roofs and tiled pavement; everything being as clean underground as is usual in surface plants. If the arched roof in such a chamber does not prevent the dripping of water, it is then best to have recourse to inclosing covers, which should be of the weather-proof ventilating pattern, and easily opened for examination of the windings. Totally-inclosing covers, admitting of no ventilation, prevent the accumulation of dust, but interfere with the cooling, and necessitate the use of large types of machines in which the material is insufficiently utilized, with a consequent lower efficiency and higher price.

Concerning the question of forced draft, a considerable diversity of opinion exists. In a new system of forced draft recently put forward, the steam is taken direct from the boiler and led by pipes into the side flues, where it becomes superheated, and is then carried to the air injectors, where it draws in and mixes with air, giving up to it a portion of its heat, and drives it into the fire, on each side of the door at a point a few inches above the dead plate. On one side of the injector apparatus a pipe is led from the flue direct, and in addition to the air, heated gas is also drawn in, so that a mixture of superheated steam, air, and heated gases is delivered into the fire at a high temperature. Tests with the apparatus have shown an increase of 30 per cent. evaporative efficiency with a marked decrease in the quantity of smoke emitted.

When electric power is used underground, due precaution should be taken that the insulation of the winding and current-carrying parts is of a character to resist the continued action of a moist atmosphere. The insulating material used for high-tension work is generally better suited to stand this action than that commonly used on low or medium pressures, and it is therefore especially important in cases where medium pressure is employed to pay particular attention to the class and method of insulation, and to avoid the use in it of any material of a hygroscopic nature. The accumulation of coal dust on the windings should be avoided as much as possible, as it might form a conducting film, or layer, over the insulation to the frames. Periodical inspection and cleaning should be enforced as a preventative. Motors should be placed in well-built chambers, properly lighted and ventilated with intake air.

Recent tests show that an ordinary miner's lamp (of the type generally worn on the miner's cap) when burning tallow, consumes 2.49 cu.ft. of oxygen and produces 1.74 cu.ft. of carbonic acid per hour. The same lamp when burning oil consumes 1.13 cu.ft. of oxygen and produces 0.78 cu.ft. of carbonic acid per hour. The same investigators determined the candlepower of various lamps by photometry as follows: Wolf safety lamp (having a wider flame than most safety lamps and a white enameled reflector), burning with a flame 9 in. high gave 8 candlepower. Scottish miners' oil lamp (consuming 13.8 grams of oil per hour) average during 15 min. with uniform flame, 1 candlepower. The kind of oil used affects the candlepower considerably. Scottish miners' tallow lamp (consuming 17.4 grams tallow per hour) average during 15 min. with uniform flame, 2.3 candlepower. Scottish miners' lamp (consuming 13 grams paraffin wax per hour) gave 1.6 candlepower. Scottish miners' lamp (consuming 19.3 grams paraffin wax per hour) gave 2.6 candlepower.

The English coal mine laws forbid the use of electric motors, that are liable to sparking, in gaseous workings. In an attempt to solve this problem, competent engineers have recently made a series of experiments to determine the proper method of encasing such motors. It was found that practically all of the protective devices proposed were a positive danger in an explosive atmosphere. Inclosings made of wire gauze or solid covers were found to be inefficient. The covering of the openings with wire gauze (even with two layers) was not found altogether satisfactory. It was discovered that if gaps were provided of a certain size, that is, not too small to prevent the egress of the heated gases and cause a dangerous rise of pressure, and not so large as to allow free passage of the burning gases, the communication of the explosion was avoided. In some cases the failure of the gauze may have been due to the too coarse mesh, but generally it was found that the gauze did not offer sufficient cooling surface to prevent the inclosed gases from being raised to a dangerous temperature, and finally allowing the explosion to be communicated to the external atmosphere.

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Illustrated.

Production of Copper in 1908

We have received official reports for the full calendar year 1908 from all of the producers in North America. These show that the production of copper in the United States in 1908 was 948,196,490 lb., against 879,241,766 lb. in 1907. In each year the statistics are computed on the uniform basis of production of the Michigan mines, plus the fine copper content of the blister copper produced by the other smelteries, plus the copper content of ore and matte exported, the last being a comparatively insignificant item. As we have previously pointed out, this method of computation differs from that based on the output reported by the refineries, and is adopted as representative of the production of the country because it comes nearest to the output of the mines. Details of the statistics are given in the accompanying tables.

PRODUCTION OF COPPER IN THE UNITED STATES.

Groups.	1907.	1908.
Michigan mines	220,317,041	222,267,444
Smelters in Arizona and Texas	262,597,624	292,048,641
Smelters in Montana and Wyoming	229,362,164	258,060,399
Smelters in Utah and Nevada	90,100,052	77,351,088
Smelters on Pacific Coast	(*a*) 21,936,026	39,880,529
Smelters in Mississippi Valley	(*a*) 24.062,550	24,391,646
Smelters on Atlantic Coast	(*a*) 13,640,930	15,675,379
Smelters in Tennessee	(*a*) 14,784,379	14,464,585
Miscellaneous	(*b*) 2,441,000	4,056,779
Totals	879,241,766	948,196,490

(*a*) These statistics do not measure the relative importance of these groups of smelters which produce much copper from foreign ore. (*b*) Includes exports of ore and matte and copper produced by lead desilverizers.

PRODUCTION OF COPPER BY STATES.

State.	1907.	1908.
Alaska	6,610,680	4,394,887
Arizona	256,866,761	290,167,795
California	34,398,823	36,890,353
Colorado	13,344,118	13,896,689
Idaho	11,471,101	8,749,559
Michigan	220,317,041	222,267,444
Montana	226,290,873	252,558,330
Nevada	1,462,450	12,174,269
New Mexico	8,652,873	8,523,652
Utah	68,333,115	70,978,952
Wyoming	2,919,137	2,384,356
South and East	(*a*) 22,408,696	20,822,368
Other States	(*b*) 6,166,098	4,387,836
Totals	879,241,766	948,196,490

(*a*) Includes Vermont, New Hampshire, Pennsylvania, Virginia, North Carolina, Alabama and Tennessee. (*b*) Includes Washington, Oregon, South Dakota, Texas and the production of the lead desilverizers and others which it is impossible to distribute according to place of origin.

PRODUCTION OF COPPER IN NORTH AMERICA.

Country.	1907.	1908.
United States	879,241,766	948,196,490
Mexico	126,710,000	89,576,464
Canada	46,356,382	55,781,992
Cuba	3,059,152	6,537,064
Totals	1,055,367,300	1,100,092,010

The production of copper in Canada and Mexico is computed on the same basis as in the case of the United States. Our statistics differ somewhat from those of the Canadian government, because the latter reckons the copper content of ore, matte and blister copper, while we do not enumerate it until it has all been converted into blister copper, which to a large extent is done after the crude material has been exported from Canada. The basis of blister copper is the only one that precludes danger of duplication. In the cases of Mexico and Cuba there are no official statistics.

Many of the producers of blister copper resmelt a good deal of scrap copper. This has been carefully excluded in our statistics. It is to be remarked that all of the copper that we report as the production of the smelters, and consequently of the mines, does not finally appear as refined metal, several million pounds per annum being recovered by the refiners in the form of bluestone. The production of the latter as a by-product in the United States was 37,654,961 lb. in 1908, compared to 34,867,650 lb. in 1907. A small portion was obtained each year as a direct product in the treatment of matte, but the bulk of this production is made as a by-product by the electrolytic refiners. The copper content of bluestone is roughly 25 per cent.

THE WORLD'S COPPER PRODUCTION.

(IN METRIC TONS).

Country.	1907.	1908.
Argentina	224	226
Australasia	41,910	40,123
Austria-Hungary	1,062	1,700
Bolivia	2,540	2,540
Canada	21,035	25,305
Cape of Good Hope (Cape Co.	4,298	4,550
Cape of Good Hope (Namaqua	2,540	2,440
Chile	28,863	38,927
Cuba	1,388	2,966
Germany	20,818	20,523
Italy	3,353	3,022
Japan	38,001	44,700
Mexico	57,491	38,190
Newfoundland	1,758	1,453
Norway	7,122	9,337
Peru	20,681	(*e*) 22,240
Russia	15,240	20,405
Spain-Portugal	50,470	53,425
Sweden	1,577	2,032
Turkey	1,270	1,068
United Kingdom	711	.....
United States	398,930	430,099
Totals	721,282	765,271

(*e*) Estimated.

The statistics of the world's production of copper ore are based on our own figures for North America, together with those of Henry R. Merton & Co., and the respective governments for other countries, the official figures being used when they are available and of undoubted accuracy.

The Virginian Railway

The opening of a new railroad into a district of established traffic has always a disturbing effect, even though the new line may develop some traffic especially its own. This has been the case with the Virginian railway, to which reference has already been made in these columns. The expected effect has been increased by reports regarding the intentions of the owners of the new line. It is stated, without contradiction and apparently from well informed sources, that the company intends to enter largely into the seaboard trade, especially in New England territory. To this end it will establish at central points on the coast large storage plants from which coal can be furnished directly to consumers; and in connection with these it will maintain steamship lines which will deliver coal to the different distributing ports. At the present time the seaboard trade is carried on mainly by sailing vessels and barges; steam colliers will be able to make quick and regular trips and to maintain stocks at the distributing yards, no matter what the conditions of wind and weather may be. How far this plan is to be carried out is uncertain, but there seems to be little doubt that something of the kind is in contemplation.

One effect will be to change to an important degree conditions in the seaboard trade. At present sales are made at prices —whatever they may be—delivered at shipping points, the purchaser paying the coastwise freight rate. Under the new plan prices will be fixed at the port of delivery, throwing the freight rate upon the selling company and making the price to the consumer of rather a speculative character to those companies which do not own their own vessels. The reports have already caused a commotion in the seaboard bituminous-coal trade and there is a degree of uncertainty which has prevented many large consumers from closing their contracts for the season.

Possibly all the current rumors are not correct. It is evident, nevertheless, that the Virginian railway intends to have a hand, and an important one, in the large trade for which it was built to serve. A fuller exposition of its plans is anxiously awaited by some of its rivals.

Current report also has it that negotiations are in progress for a combination with the Chesapeake & Ohio railroad for a Western connection, the object being to secure a share of the Western trade, which is already much disturbed at the competition of West Virginia coal.

The Anthracite Situation

Although the anthracite operators and miners have been gradually approaching an agreement, it cannot be said that the situation is yet definitely settled. As we anticipated, the very strong position of the companies has gradually forced the miners into a practical acceptance of the companies' proposition for the renewal of the present agreement for a three-years' term. A few concessions of minor importance were made by the operators' committee, apparently more for the sake of appearances than for anything else. The final proposition is being considered by a miners' convention which is now in session. It is within the possibilities, however, that some trouble may arise to prevent the settlement and it is not safe to say that a strike is finally averted; nor will it be safe to say so until the agreement is finally made and signed by both parties. Those who can recall the situation 16 or 17 years ago will remember that the worst strike on record in the anthracite country followed the actual closing and signing of a preliminary agreement.

State Regulation of Mining in Norway

As is well known, the Norwegian government has been taking an advanced position with respect to the conservation of the resources of that country, and particularly the protection of domestic interests. This has to a large extent prevented the preëmption of the great water powers by corporations. Indeed, it is considered to have retarded development to some extent.

A concession recently granted for the working of the Glomrudkollen zinc mines is illustrative of the present policy of this government. The concession is for 82 years, at the end of which period the mines revert to the state. Their operation must be carried on according to the laws governing the proper working of mines. The company must submit a working plan to the Department of Mines, which has the right of altering it, but the company may appeal for a final decision to a commission of arbitration. The company, under a penalty of 10,000 kroner, binds itself not to join any combination calculated to raise prices in Norway. Only Norwegian workmen and officials may be employed, and Norwegian material must be used if as good and not exceeding in cost by 10 per cent. that supplied from abroad. If a company store be opened the net profits accruing therefrom must be devoted to the benefit of the workmen.

IT IS INTERESTING to note that the litigation between the American and British stockholders of the Harney Peak Tin Mining, Milling and Manufacturing Company, which has been before the courts for 14 years, has been ended and a reorganization is in process of being effected. During all these years Dr. A. R. Ledoux has been receiver for the company, but has been prohibited by the courts from spending any money in development of the mines. We understand that under the terms of the reorganization the first thing to be done is to make a careful test of the most promising properties to determine what is the grade of any ore found in quantity, and to inaugurate this work Doctor Ledoux has already gone to the Black Hills. It is gratifying to know that through this settlement there is at last a possibility of establishing a tin industry in South Dakota.

AN IMPORTANT INCIDENT in its bearing upon coal traffic is the purchase by the Pennsylvania Railroad Company of the stock in the Norfolk & Western Railway Company which it sold three years ago. This large block of stock will give the Pennsylvania a controlling voice in Norfolk & Western affairs. Two considerations have doubtless prompted this purchase, one being the opening of the Virginian railway; the other is the manifest intention of the independent operators in the Pocahontas district to compete actively for coal business on the seaboard with the Clearfield, Cambria and Pittsburg regions. This can be done only by securing extremely low rates from the railroad, to meet which would involve a considerable sacrifice of revenue by all the other lines concerned.

This transaction and some other recent movements have given rise to rumors of a contemplated "soft-coal trust." To these revivals of an old story little credence is to be given. The bituminous trade is too large for one combination to handle.

Mineral Riches of the German Colonies

By Robert Grimshaw*

As the Germans are beginning to understand that they cannot compel the negroes in Africa to become farmers, also that their own people who have no capital cannot settle there and get rich, they are turning their attention to discovering minerals which they can export to Germany and other countries. In this they are succeeding admirably. The following is a résumé of a report recently published by the Imperial Colonial Department.

Hard coal, which has already been tested, and concerning which the reports as to its value are favorable, has been discovered in southwest Africa near Keetmanshoop; also in East Africa on Lake Nyassa, and in the German possessions in the Indian ocean. Iron ore is found in Togo, southwest Africa, and Kaiser Wilhelm Land. Signs of gold have been noted in both Southwest and East Africa; in the latter, recently on Kironda creek, where it is to be worked by a company already formed. Blue dirt, the soil in which diamonds are found, has been met with in several places in Southwest Africa; and in the same places a variety of other precious and semiprecious stones. Mica of excellent quality is found in Kamerun, in the district of Ostdinge.

Phosphate beds are among the discoveries in the Bismarck archipelago, and this material has been shipped therefrom. The first shipments have been received in Germany, the amount being stated as 3911 metric tons between Jan. 1 and June 30, 1908. There is marble in Southwest Africa in the neighborhood of the railway station Kubas.

As there are in the German colonies and protectorates immense areas awaiting prospectors, as for instance, in German East Africa, and on Lake Tanganyika, as well as in the Kilimandjaro district; and as farther in the back country (Hinterland) of Komerun, there are large districts which have not been geologically surveyed, the Colonial Committee charged with such work intends to have these regions properly surveyed by geologists and prospectors, in order to afford the population new sources of income.

The most important copper deposits are in the Oktavi district. There are in this region several mines, of which the Tsumeb is the most important. The ore of this mine has been shown to be very rich in copper, so that the company exploiting it has changed its original idea of working it in Africa, and intends sending the best grades to Europe for smelting. According to the opinion of experts, officially published by the government the yield of this mine should be about 35,000 tons of ore per year.

*Engineer, Dresden A, Germany.

River-bed Mining in California

Special Correspondence

More attention is being paid these days than for some time past to river mining in California. Steam shovels and engines take the place of the old wing-dam and Chinese pump in these operations, though those old appliances are still in use along the Klamath river at certain localities. Up on the Stanislaus river, which divides Calaveras from Tuolumne county and San Joaquin from Stanislaus county, several companies recently formed have taken up much of the river bottom, especially between Parrot's Ferry and Camp 9 of the Standard Electric Power Company. Hereabout the primitive style of river-bed mining will be modernized. Steam shovels are to be used to lift the auriferous gravel from the river bed. At Otter Bar similar enterprises are under way; and at the confluence of the Middle and North forks of the river, operations of the same nature are projected. Up to this time only intermittent operations have been carried on when there was a low stage of water in the stream.

A New Grondal Plant in Sweden

By N. V. Hansell*

One of the most recently erected Gröndal plants in Sweden is the one connected with the Lulea Iron Works in northern Sweden. The ore used there is taken from the well known Gellivara mines and contains 58 per cent. iron, 0.10 per cent. sulphur and 1.3 per cent. phosphorus. Although this ore is high in iron, on account of its high phosphorus content, it was found to advantage to fine grind it, separate it wet, and afterward briquet the concentrates. The latter generally contain 72 per cent. iron, with 0.017 per cent. sulphur and 0.008 per cent. phosphorus. The tailings have a total iron content of 8.4 per cent., composed of about 1.5 per cent. magnetite and the balance in silicates and hematite. They contain 5.7 per cent. phosphorus. The quantities of concentrates and tailings stand in the ratio of 78 to 22, making the total recovery of iron 97 per cent. The briquets usually average about 70 per cent. iron.

In the Swedish iron industry briquets have been extensively used in the blast furnaces. From an ore containing as much phosphorus as the Gellivara briquets are produced with only 0.008 per cent. phosphorus and 0.006 per cent. sulphur. The iron obtained is high grade, with guaranteed 0.01 per cent. sulphur and 0.02 per cent phosphorus. In the blast-furnace charge briquets alone are used, making the iron percentage of the charge between 65 and 70. The charcoal consumption per ton of pig iron is said to be lower than in the usual Swedish practice, on account of the physical character of the briquets.

*29 Broadway, New York City.

Steel and Iron in France

The production of pig iron in France is reported by the Comité des Forges as below, in metric tons:

	1907.	1908.	Changes.
Foundry iron	651,700	705,527	I. 53,827
Forge iron	673,885	543,967	D. 129,918
Bessemer pig	122,046	118,121	D. 3,925
Basic pig	1,988,343	1,949,107	D. 39,236
Special irons	152,975	74,428	D. 78,547
Total	3,588,949	3,391,150	D. 197,799

Foundry iron includes 111,101 tons direct castings in 1908. Special irons included ferromanganese and similar alloys. The raw material used in 1908 included 7,357,686 tons domestic iron ore, 1,508,114 tons imported iron ore, 144,339 tons manganese ore and 649,652 tons of scrap, cinder, slag and pyrites residue.

The steel production is reported as follows, in metric tons:

	1907.	1908.	Changes.
Acid converter	78,771	77,581	D. 1,090
Basic converter	1,669,757	1,632,296	D. 37,461
Open-hearth	1,001,463	1,002,789	I. 1,326
Crucible	16,782	12,662	D. 4,120
Electric	.....	2,289	I. 2,289
Total	2,766,773	2,727,617	D. 39,156

Electric steel was reported separately in 1908 for the first time. The figures above are for ingots. Finished steel reported was 1,860,308 tons in 1907, and 1,894,022 in 1909; an increase of 33,714 tons. The larger items of finished steel in 1908 were 390,037 tons merchant steel, 344,772 tons plates and sheets, 333,756 tons angles, shapes, etc., and 322,241 tons rails.

The National Bureau of Standards in the Department of Commerce and Labor has contracted with Constructor Emery, who built the large testing machine at the Watertown arsenal, to furnish a new testing machine, to cost $150,000, for the use of the Bureau of Standards. This machine will be installed for the purpose of making tests for the public and for the other departments of the Government, the work of the Bureau of Ordnance in the War Department being now limited to the testing of materials for guns and gun carriages.

The first electrometallurgical plant for making tool steel in Russia has just been installed at the Oboukhoff works, near St. Petersburg. Professor Lipine, after visiting most of the plants of this nature in other countries, decided that the Heroult system was the best adapted for the purpose, and the present equipment is of that type.

The Hand Jig in Practice

By C. N. Nelson*

Under my direction at Santa Barbara, Chihuahua, we had occasion to use over 30 hand jigs and the following data and sketch are from notes taken over a period of 10 months. The ores of the district are mainly oxidized lead and silver minerals with occasionally gold and copper; and it is on these soft, easily sliming ores that the hand jigs prove their usefulness. With sulphides, of course, good results are easily obtained.

As may be seen from the sketch, the screen moves in the water and the hutch product, called *lamas* or slimes, is retained with the water in the hutch. When the latter fills up with slimes nearly to the top the screen is removed and the hutch emptied by shoveling. The concentrates are obtained from the screen by the use of a tin scraper, first cleaning off the layer of tailings and then the concentrates. Five-gallon oil cans are used to remove the products. This sounds like a tedious and costly operation but as one man can produce about one-half a ton of concentrates and slimes per day of nine hours, it is not very costly with Mexican labor.

The jigs are made in batteries of two and three for economy of lumber and space. A good arrangement is to have two rows of jigs with a track for the tailings car down the center, and room for ready access of wheelbarrows to all the jigs.

The heads should be carefully screened, and two or three sizes maintained as closely as possible. The mesh of the jig screens is, of course, varied according to the size of the heads and proportion of slimes desired. A ¼-in. aperture iron wire screen was used for the coarser material, and ⅛-in. aperture for the finer. For more careful work still finer screens may be used.

The jig patio is generally let out on contract to one man who contracts to deliver the concentrates and slimes on the patio above a given minimum assay value. The contractor furnishes all labor necessary but has the ore delivered to the screen at the head of the patio. The prices were about $2 per ton for the coarse and $1.50 for slimes, with labor at 75c. per day of nine hours. These prices varied with the grade of the heads and the convenience of operation.

The water was furnished from a tank about 8x5x6 feet, which supplied 20 jigs and took its small supply from the mine. The water is needed chiefly in refilling the hutches after a clean-up, though a little is used all the time to make up for the splash.

The heads are wheeled up to the jig and piled in front and the screen filled by shovel when required. The concentrates are not removed every time the tailings are cleaned off, but allowed to accumulate a little. The motion of the screen is given by a quick down stroke on the long arm with a slower recovery. The spring of the arm and looseness of the suspension give an even motion with the required variation in the up-and-down movements. This action has to be learned by the operator; the men also get very skilful in judging the amount of work needed to clean a screen full of ore, and the depth to scrape to keep the tailings clean.

The assays given in the accompanying table were averaged from about three months' operation on 3000 tons of ore. The value is given in United States currency on the basis of silver at 60c. per oz., copper at 18c. per lb., lead at 4c. per lb., the metric ton being used.

HAND JIG OPERATIONS.

	Oz. per Ton		Per Cent.		Value Per Ton.
	Au.	Ag.	Pb.	Cu.	
Ore	.12	8.0	11.6	...	$18.41
Concentrates	.17	24.5	34.0	2.0	55.94
Slimes	.42	12.0	29.0	0.6	43.52
Tailings	.06	3.0	2.5	...	5.20

The use of hand jigs is peculiarly appropriate to small mines in a region where water is scarce and ores soft and easily slimed, and where a shipping product must be made with moderate initial outlay. In theory the jig is rather interesting, as it may be said to combine the action of the jig with that of the old Cornish dolly-tub.

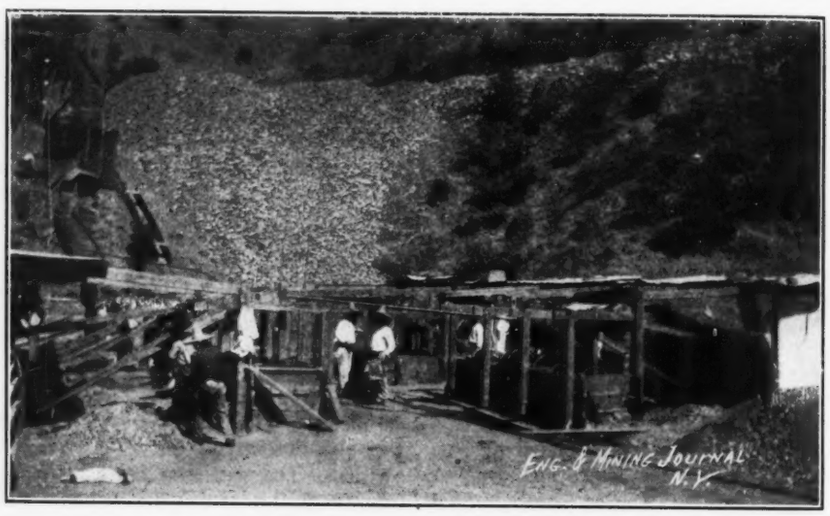
The domestic production of metallic sodium in 1908, according to statistics collected by the Engineering and Mining Journal, was 2000 short tons valued at $1,000,000.

*Mining engineer, 129 North Norwood avenue, Buffalo, N. Y.

The Kent Coalfield in England

Special Correspondence

Kent Collieries, Ltd., is a company formed in 1905 to work the coal which had been proved to exist under the well known Shakespeare's cliff at Dover, England. For one reason or another the company has so far succeeded in doing little more than proving the existence of the coal as a workable deposit, and is now seeking for fresh capital. Two shafts have been sunk, known as No. 2 and No. 3. No. 2, which has an inside diameter of rather more than 14 ft., has been sunk to a depth of 1632 ft. and has penetrated several seams of coal. This shaft is lined with iron casing and concrete backing to a depth of 1200 ft. below which it is lined with brick and cement. No. 3 shaft, which will be the main hoisting shaft, has an inside diameter of 18 ft. and is down 674 ft., the bottom being some distance yet above the coal. In No. 2 shaft several seams of coal have been cut, while others have been proved to exist by boreholes. Coal was raised from a seam at 1274 ft. and 200 tons were sold to the railway company, which traverses the coalfield, for testing purposes, the results of the trials being reported satisfactory. The thickness of the seam at 1274 ft. was 20 in. A larger seam, 4 ft. in thickness, was met with in a borehole at a depth of 2221 ft. and it is intended to sink the shafts to this depth, when further funds are subscribed.



HAND JIG PATIO AT SANTA BARBARA, CHIHUAHUA

The coalfield has been reported on by a large number of experts, including Professor Hull, a member of the Royal Coal Commission 1901 and a director of the company. Professor Hull states that no fewer than 13 seams of coal of various thicknesses were proved by boring, of which seven might be considered workable. The lowest was the 4-ft. seam mentioned above. The bottom of the coal formation

has not yet been met with, so that further coal seams may still be found to exist. Another expert who has reported favorably on the undertaking is Carl Hold, a German mining engineer from Westphalia.

The possibilities of the coalfield have recently attracted the attention of prominent coal owners of the South Wales coalfield and their coöperation has been promised, provided the shareholders will find the money required for the further sinking of the shafts and for equipping the colliery with a suitable plant for mining the coal and making it marketable. These practical gentlemen from South Wales are not prepared to take up the scheme unless they first have all the money which their long experience in coal mining tells them will be required, the amount being about £125,000. If the colliery is properly equipped these gentlemen, one of whom is chairman and the other the managing director of the well known Powell-Duffryn Steam Coal Company, of South Wales, say that they believe that Kent coal can be won profitably.

The geographical position of the colliery is favorable. Situated on the seacoast close to Dover, the coal would find a ready market for railway, industrial and shipping purposes. According to the South Wales experts, however, too much weight ought not to be placed on the geographical situation, because Newcastle coal could be delivered at the wharves in the Thames for 11s. 6d. per ton and if suitable arrangements existed at Dover harbor, coal could no doubt be delivered there at a price to compete with Kent coal. The businesslike way in which the undertaking was discussed by the South Wales coal experts at a recent meeting of the shareholders inspired confidence and it seems probable that the requisite amount of capital will be found. If so, it will probably not be long before coal mining in Kent, the garden of England, will become an accomplished fact.

The Consumption of Scrap*

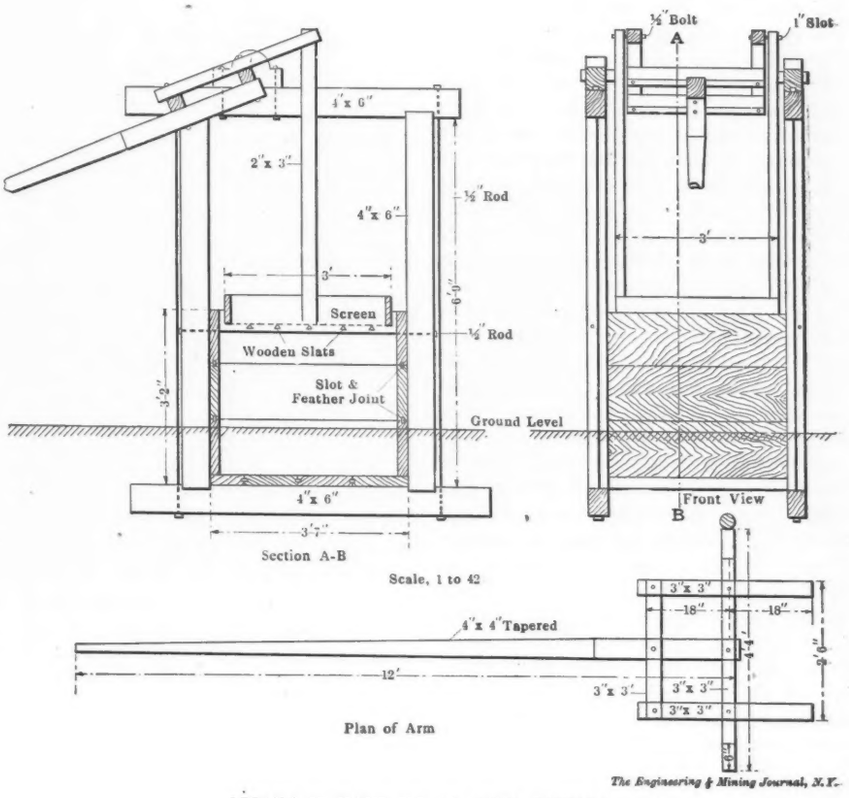
In addition to the millions of tons of iron ore which are annually consumed in this country in the manufacture of pig iron there is an ever-increasing consumption by our blast furnaces of mill cinder, scale, scrap, etc. While the consumption of materials of this character is not annually ascertained by the American Iron and Steel Association, it has been ascertained by the Bureau of the Census for the census years 1880, 1890, and 1900; also for the calendar year 1904. The Bureau has also ascertained for the same years the consumption of old rails and all kinds of iron and steel scrap by our rolling mills and steel works. By combining these two statements the interesting results which are shown in the following table are obtained. Gross tons are used throughout:

Scrap, etc.	1880.	1890.	1900.	1904.
Blast furnaces	316,114	1,145,699	1,600,313	1,865,385
Rolling mills and steel w'ks.	1,198,842	1,726,162	4,113,287	5,124,277
Total	1,514,956	2,871,761	5,713,600	6,989,662

The great increase shown in the table in the use of scrap by rolling mills and steel works from 1890 to 1900 and from 1900 to 1904 is explained by the development of the basic open-hearth steel process, which actively began late in the 90's and which has since made wonderful progress. The acid open-hearth process is also a large scrap consumer. While no accurate figures are available it is probable that in 1904 the open-hearth process alone consumed approximately 3,000,000 tons of iron and steel scrap, and that in 1907, when the production of basic open-hearth steel was more than double that of 1904, the consumption of scrap in the open-hearth process approximated 6,000,000 tons.

In the above table the iron and steel scrap consumed by iron foundries, cast-iron pipe works, car-wheel plants, forges which manufacture scrap bars, etc., is not considered. If the scrap consumed by establishments of this character were included, and due allowance were made for the great increase in consumption by our basic open-hearth steel furnaces, it would probably be found that the total consumption of iron and steel scrap, cinder, scale, etc., in this country in the calendar year 1907 would amount to at least 12,000,000 tons, and might reach 12,500,000 tons, or almost one-half of our total production of pig iron in that year. The scrap and cinder consumption of 1908 was naturally much less than that of 1907. There was doubtless a large accumulation of scrap in 1908. . . . We are informed that there is an increasing tendency to substitute scrap for pig iron in the open-hearth furnace.

*From the *Bulletin* of the American Iron and Steel Association.



DETAILS OF HAND JIG AT SANTA BARBARA

The Minister of Labor in Belgium has proposed a plan for the pensioning of old miners. Funds are to be raised by taxing employers 15 fr. per year for each miner engaged, and a similar amount is to be deducted from the wages of each mine worker. These receipts, enlarged by grants from the government, are expected to permit the payment of at least 360 fr. per year to every miner who reaches the age of 60 years.

According to the *Queens. Gov. Min. Journ.*, both stream and lode tin are reported as being discovered in the Northern Territory of South Australia, the locality on this occasion being a few miles east of Eureka mines of Pine creek.

Zinc Mining in Butte

By A. H. Wethey*

Butte has been known for so long a time as one of the greatest sources of supply of copper in the world, that it has not received much recognition heretofore as a probable center from which large quantities of zinc may be furnished. It is true that considerable quantities of zinc ore have been found from time to time in various of the producing copper mines of Butte, but such ores have been more valuable for copper and silver than for the zinc they contained, and no effort has been made to recover the zinc.

Extensive development work during the last two years in the eastern end of the Rainbow lode has resulted in the discovery of immense deposits of zinc ore, containing from 10 to 50 per cent. zinc. In order to render the ores of sufficiently high grade for the zinc smelters, the Butte Reduction Works has recently installed a concentration plant for that purpose. The concentration of zinc ores differs from that of the copper ores in the Butte camp. With the copper ores every effort is made to save as much of the copper as possible with a minimum amount of crushing. It is only after all the coarse mineral has been saved that fine crushing is resorted to in order to save the copper in the slimes. With the zinc ores it is found necessary to crush the ore much finer than is the practice with the copper ores. The concentrates from the ores developed in the Elm Orlu mine owned by the Elm Orlu Mining Company, and the Black Rock mine owned by the Butte & Superior Copper Company, readily concentrate up to above 40 per cent. zinc, and will carry in addition from 3 to 4 per cent. copper, from 20 to 30 oz. silver and from $1 to $2 in gold. The zinc smelters after distilling off the zinc sell the residue to lead and copper smelters, for whom it is an excellent material, it being practically free from sulphur, while most of the zinc is eliminated in the distillation process.

The concentration plant at the Butte Reduction Works will have a capacity of about 300 tons per day. It requires about 2 to 2½ tons of the zinc ore to make 1 ton of zinc concentrates. It is estimated that in the two properties already referred to, there are approximately 400,000 tons of zinc ore already developed. It seems singularly appropriate that Ex-Senator W. A. Clark, who has been interested in the Butte district for over 30 years and was one of the pioneers in the development of its mines, and also in the erection of plants for the treatment of the Butte ores, first for the treatment of silver ores and then for the treatment of copper ores, should now be among the pioneers in the erection of a plant for the wet concentration of zinc ores. The Elm Orlu property is owned by Ex-Senator Clark and his son, W. A. Clark, Jr., while the Butte Reduction Works is owned by Ex-Senator Clark, and is the oldest smelting and concentrating plant in this district, having been in continuous operation since 1885.

*General manager for W. A. Clark's mining interests, Butte, Mont.

A New Direct Method for Determining Nickel in Steel

By H. Grossmann and Walther Heilborn*

When separating nickel from tri-valent iron by the method already described in the Journal, p. 1044, 1908, the precipitation of ferric hydroxide by caustic alkali or ammonia must be prevented. This is most easily effected by the addition of some soluble tartrate. The amount of tartrate to be added varies, according to the relative amounts of nickel and iron, and in the analysis of nickel a great deal more of the tartrate has to be added than in the analysis of alloys containing, approximately, equal amounts of the two metals. If to a solution of nickel steel only a little more tartrate is added than necessary to prevent the precipitation of the two hydroxides and then the precipitation of the nickel by the new method effected, the color of the solution above the precipitate remains red and the liquor contains most of the ferric iron in the colloidal state, for the complex ferric alkali-tartrate primarily formed is largely hydrolized. This is corroborated by polarimetric methods, not to be described here. The colloidal solution produced by the hydrolysis not only retains considerable amounts of the nickel-dicyandiamidine, but may also coagulate spontaneously and completely spoil the analysis. If, however, a large excess of tartrate is added the hydrolysis is largely diminished and the alkaline solutions of a yellowish or greenish color will keep unchanged many days and will always yield good results.

Scheme of Analysis

In consideration of the above the practical execution for the determination of nickel in steel is as follows: Dissolve 0.5 to 2 grams steel, according to the percentage in nickel, in aqua regia, evaporate on the water bath to a volume of about 10 c.c., filter off any impurities and the silica precipitated and add to the solution about 15 grams of sodium-potassium tartrate for each gram of steel. In the presence of much manganese oxidation must be prevented by the addition of some hydrazine sulphate. In case, after addition of the tartarte, a crystalline precipitate of yellow color is formed (it consists of potassium bitartrate colored by inclosed mother liquor), a little ammonia is added and the precipitate redissolved. To the solution giving off a strong odor of ammonia an excess of caustic soda is added. In most cases about 40 c.c. of a 20-per cent. solution seems to be sufficient. In case, however, no precipitate is formed after a little while, some more caustic soda is added. The nickel dicyandiamidine naturally is formed more quickly with a high percentage of nickel in the steel and with a small amount of solution. In the analysis of alloys rich in nickel the filtration may be effected as soon as the liquor above the precipitate has cleared up completely, while solutions containing but little nickel are left to stand for quite a while before filtering.

The suitability of the described method is shown by the accompanying analyses applied to six different grades of nickel steel from Krupp. The percentages given in the last column are those found at the Krupp works by the potassium cyanide method.

ANALYSES OF DIFFERENT GRADES OF NICKEL STEEL.

Amount Used, Grams.	Ni—$(C_2H_8N_4O)_2$ Found, Grams.	Ni Found, Per Cent.	Ni Found by the KCN Method, Per Cent.
2.0235	0.1690	1.88	1.88
2.0878	0.1726	1.86	
1.2784	0.1710	3.01	2.96
1.3002	0.1699	2.94	
0.9936	0.2155	4.88	4.91
1.0190	0.2212	4.89	
0.5434	0.1312	5.43	5.45
0.6012	0.1443	5.40	
0.6612	0.2596	9.56	9.58
0.6302	0.2680	9.57	
0.5096	0.5938	26.22	26.25
0.6100	0.7103	26.20	

*Pfalzburgerstr. 8, Berlin W. 15, Germany.

Batopilas Mining Company

The report of the Batopilas Mining Company, April 12, 1909, for the year ending Dec. 31, 1908, states that the work for the year was confined to the Porfirio Diaz Tunnel, Todos Santos, San Miguel, Camuchin, Animas and Exploration mines. The development work consisted of 21,343 ft. of drifts, shafts and raises. The ore handled during the year was, first-class, 944 tons, second-class, 99 tons, and third-class, 31,731 tons, or a total of 32,776 tons. The 100-stamp mill operated 258 days, crushing 31,732 tons of ore. The average net recovery from the third-class ore was 6.3 ounces silver per ton, producing 19.15 tons of first-class concentrate, containing 96,821 ounces. There were also 613 tons of second-class concentrates containing 103,263 ounces or a total of 200,085 ounces. The company's surplus, which has accumulated during the years 1905 to 1908 is $715,085.

According to E. F. Pittmann, undersecretary for mines, the mineral production of New South Wales for 1908 was £8,609,607, a decrease of £1,967,771, as compared with that of 1907.

Personals

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Cortlandt E. Palmer has returned to New York from Mexico.

B. B. Thayer has gone to Butte, Mont., on a periodical tour of inspection.

C. Colcock Jones is examining mining property in the vicinity of Goldfield, Nevada.

R. Meeks is at Webster, N. C., superintending the erection of machinery at the nickel mine there.

Huntingdon Adams is now manager of the Compañia Minera de Natividad y Anexas, S. A., of Oaxaca, Mexico.

Camille Clere passed through New York last week on his return to Paris after a year spent in Colombia and Ecuador.

H. F. E. Gamm has returned to Rutherford, N. J., from a professional trip to Blacksburg, S. C., to visit some manganese and tin properties.

H. W. Hardinge is returning to New York, having made an extensive trip through Colorado and Arizona in the interest of the conical mill.

Norval J. Welsh has completed a two months' examination trip in Coahuila and Chihuahua, Mexico, and is at the Engineers' Club, New York, for an indefinite stay.

Percy E. Barbour has accepted the management of the Promontorio mines at Minas Nuevas, Sonora, Mexico, recently acquired by the Clark Copper Company, of Los Angeles, California.

James MacNaughton, general manager of the Calumet & Hecla, has returned to the mine after an extended visit South, where he went to recover his health, having been ill with appendicitis.

R. M. Raymond has been appointed managing director of El Oro Mining and Railway Company, and will have his headquarters in the city of Mexico. Alfred F. Main succeeds Mr. Raymond as general manager at El Oro.

George Gordon Crawford, of Birmingham, Ala., president of the Tennessee Coal, Iron and Railroad Company, who has been abroad for the past three months for his health, after an attack of typhoid fever, is expected in New York, April 28, and in Birmingham a few days later.

Edward Flynn, former president, of Alabama district No. 20, United Mine Workers of America, has been appointed chief State mine inspector of Alabama for a three-year term, commencing May 1. Mr. Flynn served out the unexpired term of J. M. Gray, who took a position with a Walker county coal company.

F. G. Coggin, superintendent of the Champion and Baltic stamp mills of the Copper Range Consolidated Company, and also the Atlantic stamp mill, has resigned from the Copper Range mills, to take effect May 1. He will be succeeded by Edward Keopel, superintendent of the Trimountain mill, who will then become head of all three of the Range mills. Mr. Coggin will for the present remain as head of the Atlantic mill.

Obituary

Job Froggett died in Youngstown, O., April 18, aged 80 years. For over 40 years he had been prominent as a blast furnace manager in the Mahoning Valley district. He retired from active work 10 years ago.

William M. Stewart died in Washington, April 23, aged 82 years. He was born in Lyons, N. Y., in 1827, but passed most of his boyhood in Ohio. He entered Yale College, but left there to join the rush to California in 1849. After mining for some years he studied law and was admitted to the bar. About 1860 he went to Nevada and soon became prominent in the then new territory as an owner on the Comstock, and in politics. In 1863 he was chosen one of the United States Senators from the new State, and was in the Senate until 1875, when he returned to Nevada and engaged in mining. In 1887 he was again elected to the Senate and served three continuous terms, until 1905. During that period he became prominent as a leader of the advocates of silver coinage, and was the most widely known of the group of "silver senators." After his retirement from Congress he lived chiefly in Washington, though he frequently visited Nevada, where he had extensive interests in the newer mining developments of the State. Senator Stewart made and lost several fortunes in the course of his career, but is believed to have been possessed of valuable property at the time of his death.

Societies and Technical Schools

Morenci Mining Society—A society has been organized at Morenci, Arizona, for the purpose of visiting the mines of the district and studying their geological features and methods of working.

Canadian Mining Institute—A meeting of the Cobalt Branch was held in Cobalt, Ont., April 21, at which R. W. Brigstock was elected chairman, A. A. Cole secretary-treasurer for the ensuing year, and E. L. Fraleck, Robt. Bryce, S. L. Logan, M. T. Culbert and H. P. Davis as executive committee. E. L. Fraleck read a paper on mining conditions in Ontario; Neil McDonald spoke on Larder Lake, and A. A. Cole on sampling at La Rose vein. President W. G. Miller, of the Institute, made an address, congratulating members on the success of the branch.

Missouri School of Mines—The Senior class accompanied by Professor Durward Copeland and Instructors Boyd Dudley, Jr., and H. T. Mann, has been visiting metallurgical plants in St. Louis and vicinity. At the Laclede-Christy plant the manufacture of refractory materials used in furnaces was studied. At the plant of the St. Louis Blast Furnace Company the class saw the production of pig iron and at the Scullin & Gallagher plant the open-hearth method of steel manufacture. The metallurgy of zinc was investigated at the Edgar zinc works and the metallurgy of lead at the Federal Lead plant at Federal, Ill., at the St. Joe Lead plant, at Herculaneum, and the National Lead Company's plant at St. Louis.

University of Wisconsin—This institution at Madison has arranged a new course in mining engineering, to cover four years. Ore dressing and assay laboratories are to be equipped in a special building. A course in practical assaying will follow those in general chemistry and quantitative analysis. The course in excavation and quarrying will include excavation, explosives, blasting and allied subjects. Tunneling, boring and shaft sinking will form the subject of another course in which the ventilation, drainage, and timbering of mine shafts will be considered, with the methods of sinking shafts. In the course on prospecting and mine development the relation of mining geology to exploration will precede a consideration of the various forms of prospecting on the surface and by shafts and drifts, and the development of veins discovered. A separate course in exploitation of mines will be given. Mine accidents, their causes, control and prevention will be treated in the general course.

American Society of Engineering Contractors—On April 14 and 15, meetings were held at the United Engineering Society building, in New York, at which a constitution was adopted and officers and directors were elected. The object of the society is the advancement of engineering knowledge and contracting practice; the maintenance of a high professional standard among its members and the elimination of those practices and abuses that now exist in the engineering and contracting business, and to strengthen the bond that should exist between engineers and contractors. Officers for the first year were elected as follows: George W. Jackson, Chicago, president; Halbert P. Gillette, New York, first vice-president; F. Baxter, New York, second vice-president; Daniel J. Bauer, New York, temporary secretary. The society will begin monthly meetings in the fall. It is already assured of a large membership. The temporary secretary has his office at 721 Park Row building, New York.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Butte, Denver, Goldfield, Salt Lake City, Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

April 23—The dredge miners are having more troubles of their own because State Engineer Ellery comes out in the public press and says that the main contributing cause of the overflow of the Feather river at Biggs is the dredges. The great piles of rock which they have left behind them in their operations have changed conditions so that the river is obstructed and the flow of water is naturally retarded in its movement toward the Sacramento river. He wants the dredges to carry on their operations according "to one system." He is compelled to confess that erosion is another cause of the floods but says that "this would not happen if the dredges were compelled to level out the heaps of cobbles and stones which they have piled up." He gives it as his opinion that dredge mining is a matter that must be controlled or otherwise the rivers will be ruined. Mr. Ellery intends sending an engineer from his office to make a complete detailed survey and prepare for overcoming the present bad conditions. A levee along the west side of the river is suggested and it is also thought that the river must be "straightened."

The "good roads" question in the mining districts of California is one attracting much more attention than ever before. In fact it has become recognized, that the more prosperous and active camps, or districts, are those which have good transportation facilities. At the present time a number of mining communities are trying to get better roads to places near railroad lines. Washington, 18 miles from Nevada City, is one of these. During the winter the mining companies at Washington had to keep the road open with their own teams. To develop the mineral resources of that portion of Nevada county there should be good transportation facilities and the Nevada County Promotion Committee has taken the matter in hand for the mining companies with the idea of getting the county itself to pay out more money for good roads.

Sierra county, an isolated mountain region without railroads, and at an elevation where there is much snow in winter, has a number of mines, but they still remain largely in an undeveloped condition owing to lack of good communications. It is believed that the prevailing conditions would be greatly bettered by the construction of a road from the vicinity of Goodyear Bar, Sierra county, to Marysville, Yuba county, following generally the shortest practicable route along the North Yuba river. The mining people of the county are engaged in an effort to make the county supervisors build it. A number of mining companies have offered $1000 each toward the proposed road and other citizens of Forest, Alleghany, Downieville, Sierra City and other towns will contribute.

Many oil producers who have been vigorously denying that there was an overproduction of petroleum in California have met with a surprise when officials of the independent producers announce that an excess of 10,000 bbl. per day above consumption is now being made, and that by the end of the year this excess will be about 20,000 bbl. daily. A curtailment of production is advised until business conditions improve and the market can absorb a greater amount of oil. The Associated Oil Company has about 750,000 bbl. in storage in the Kern river field and the Standard Oil Company has 12,000,000 bbl. It is impossible to dispose of this oil at present prices. Meetings of those principally concerned will shortly be held and it has virtually been agreed that a suspension of development throughout the State will be recommended.

Meantime the oil companies listed on the Oil Exchange paid in dividends $402,000 last month and this does not include some of the very big ones. But the Japanese have quit taking oil from Gaviota—the Santa Maria field—and none has been sent them this year. It was thought that the demand from that quarter would greatly increase but the contrary is proving to be the fact.

Butte

April 21—On February 19 a further hearing of testimony in the case of Fred Bliss vs. Anaconda Copper Mining Company, *et al.*, was had in the Federal district court before Judge Hunt. The mining company had some time previous offered testimony to the effect that everything possible was being done toward the elimination of the poisonous fumes from the smoke of the Washoe smelter. At the hearing held on the nineteenth, the complainant was to have an opportunity to give testimony showing by what means the company could further abate the smoke nuisance. The complainant failed to introduce any testimony on this point, but instead filed his written offer to arbitrate the question at issue. In his offer to arbitrate, the complainant states that he is willing either to submit the matter to a board of arbitration or to have condemnation proceedings instituted in the ordinary manner for the purpose of allowing the smelting company to purchase his land. The complainant further insists that should the defendant mining company agree to arbitration, such arbitration should include the claims of all of the members of the Deer Lodge Valley Farmers Association, who are equally interested with complainant in the matters involved in the trial of the case. The decision of the court may not be made for some time to come.

In the action of E. W. Beattie, Jr., vs. Bald-Butte Mining Company, instituted in the Federal district court a short time ago, Judge Hunt recently appointed N. P. Walter and Cornelius Hedges, Jr., as receivers for the company. This allows one representative for each of the two contending factions in the company. The State Board of Railroad Commissioners has decided to reopen the hearing on coal rates recently terminated. The hearing will probably be some time before May 1.

In the case of the United States against the Northern Pacific Railway Company *et. al.*, Judge Hunt, of the Federal district court, has entered a decree in favor of the Government in conformity with his decision rendered a week ago. By the decree the patent of the Northern Pacific to certain coal lands in Carbon county is declared to be null and void and the company is enjoined permanently from asserting any claim to the land. The case will doubtless be appealed to the circuit court of appeals.

Denver

April 23—In the Cripple Creek district, the apex and trespass controversy between the Jo Dandy Company and the New Haven Gold Mining Company, has been amicably adjusted, and the $100,000 plant of the Jo Dandy (which was burned some months ago) will probably be rebuilt at once. The production of this mine prior to 1904 was large; the ore is found in a mineralized phonolite dike which traverses the property, and also in a fissure zone in the breccia. In the Eclipse No. 1 claim of the New Haven Company, the gold is in a system of parallel narrow seams which form the vein; it is also found in the breccia.

The deep drainage tunnel appears to be in difficulties, inasmuch as only $388,500 of the $500,000 required has been subscribed, and 70 per cent. of the former

sum has already been spent. The tunnel company has asked the Colorado Springs Mining Stock Association for $5000 to assist in the work, and will ask donations from all those mining companies in the district which have not already contributed. The original water level of the district was at about 9600 feet elevation, and was lowered first by the Standard tunnel, the portal of which was at 9027 feet, and next by the El Paso tunnel, at 8783 feet, the present one being at 8020 feet. It is generally considered as a great basin or collection of basins of underground water connected with one another, in the breccia area. Practically all the mines in this area will be unwatered by the completion of this deep drainage tunnel, and it is therefore felt that all mines in the district should contribute toward its construction.

It was shown at the annual stockholders' meeting that the Eagle Ore Company in 1908 sampled 193,000 tons of ore. A theft of concentrates is reported from the Golden Cycle mill, and it is stated that the manager has secured the return of $5000 in cash and other valuables forming part of the proceeds of the robbery.

In the Red Mountain district, on the divide between Ouray and Silverton, the San Antonio company, owning the Carbon Lake mine, is the only one doing any extensive work at this writing. This bids fair to prove one of the largest copper producers in the State, and the manager is only awaiting the opening of the Silverton railroad to send down 50 cars of ore which he has stacked up at the mine. From July 1, 1908, to Feb. 1, 1909, 178 cars of about 23.5 tons each were shipped to the Durango smelter, the average yield of the ore being 11 per cent. copper, 8 per cent. lead, 0.12 oz. gold and 7.25 oz. silver. Several carloads ran from 20 to 22 per cent. copper, this high-grade being mainly enargite. This ore has been produced from drifts and stopes from a shaft only 200 ft. deep, but the orebody is from 40 to 60 ft. wide. A tunnel, the total length of which will be 2300 ft., and which will deliver the ore into the railway cars, is now in 1600 ft., and should cut the orebody 300 ft. below the present workings.

In the same district, the Red Mountain Railway, Mining and Smelting Company, owning a large area, including the Yankee Girl, Robinson and others of the early heavy producers, is doing but little owing to financial difficulties. The long Joker tunnel of this concern was stopped owing to lack of funds, within 200 ft. of the Gennessee-Vanderbilt vein, from which so much was expected. A few leasers are at work, however, and the Treasury tunnel is working a small force.

Salt Lake City

April 23—Ore shipments from the Tintic district for the past week to the Tintic and Salt Lake valley smelters were as follows: Centennial Eureka, 40 cars; Colorado, 28; Iron Blossom, 33; Sioux Consolidated, 16; Brooklyn, 6; Dragon Iron, 29; Ajax, 2; Beck Tunnel, 7; May Day, 2; Yankee, 2; Black Jack, 2; Eureka Hill, 1; Bullion Beck, 2; Swansea, 4; Mammoth, 21; Laclede, 1; total, 196 cars.

The annual meeting of the Emma Copper Mining Company resulted in the election of the following officers and directors: John A. Kirby, president; Joseph Lipmann, vice-president; H. S. Joseph, treasurer; W. M. Wantland, secretary; these officers, with H. E. Peery, of Ogden, constitute the directorate. The company owns a number of patented claims in the Alta district.

It is announced that interests affiliated with the Nevada-Douglas Copper Company have formed a corporation for the purpose of providing a custom smelter in the Yerington district in Nevada. It is understood that the construction company, to whom the contract for the railroad has been awarded, has agreed to have the railroad from Wabuska to the Nevada-Douglas mine, completed and running by August 1. The Orem interests have recently acquired the townsite of Morningstar, near the mines, and it is understood that they have rejected the overtures of well known smelting interests to erect a plant in the Yerington district, and take a controlling interest in the Nevada-Douglas properties.

At the annual meeting of the Utah Consolidated Mining Company, Sidney Chase, of Chase & Barstow, bankers, of Boston, was elected a director to succeed James Phillips, Jr. Other retiring directors were reëlected. At the annual stockholders meeting of the Utah Copper Company, on April 23, the following directors were reëlected: J. Dawson Hawkins, C. M. MacNeill and Spencer Penrose, all of Colorado Springs; D. C. Jackling, of Salt Lake; Charles Hayden, of Boston; W. B. Thompson and John Hays Hammond, of New York, and K. K. MacLaren, of Jersey City. Mr. Hammond was reëlected managing director. The following officers were reëlected: President, C. M. MacNeill; vice-president and general manager, D. C. Jackling; secretary and treasurer, Spencer Penrose.

Goldfield, Nevada

April 23—Four hundred and twenty men are employed by the Goldfield Consolidated Mining Company. The amount of ground broken in the various properties for January and February was: Combination, 1656 ft.; Mohawk, 986 ft.; Red Top, 1818 ft.; leasers, for January, 1489 ft. The Clermont shaft is 1050 ft. deep and is connected with the Mohawk workings at the 600-ft. level by a 1000-ft. crosscut. A station has been cut on the 1000-ft. level, from which point laterals will be run to thoroughly explore the property at this depth. This ore shoot, as developed, shows a width varying from 40 to 50 ft., and from 80 to 100 ft. long. It is opened up on the 230-, 280- and the 380-ft. levels. The tonnage of ore extracted and treated for the first three months of the year was: Mined, 45,967 tons; milled, 45,606 tons; shipped, 341 tons. From this the net profits are estimated at $1,584,436. The costs for mining, milling and transportation are: January, $7.136; February, $6.315, and estimated for March at $5.85 per ton. The results obtained in the new mill are highly gratifying to the management, and a comparison of cost sheets shows that it is treating the same grade of ore at less than one-half the amount per ton as charged against the Combination mill.

J. F. Brim, of the Ely Amalgamated Copper Company, has been advised that the Steptoe Valley Smelting Company has deeded back to the Government a strip of land 1½ miles long by ½ mile wide near the smelter. Some of this territory has been claimed by mining companies and individuals and this action on the part of the Steptoe company is a victory for the other owners. Among those who will be benefited is the Ely Amalgamated Copper Company. This ground is within 100 ft. of the smelter. They will at once take steps to obtain patents for their claims and will begin the shipment of ore to Utah smelters at an early date.

The report of the State bullion tax agent, James F. Haley, submitted to Governor Dickerson April 16, shows a gold production of $14,373,545 for the year of 1908, the tax collected on this being $101,000. The production by counties is as follows: Nye, $6,517,174; Esmeralda, $4,917,507; Lincoln, $809,606; Storey, $700,645; Eureka, $454,426; White Pine, $207,101; Humboldt, $103,850; Churchill, $100,074; Elko, $92,854, and Lyon, $47,360.

Toronto

April 24—The Department of Public Works has begun the survey for a wagon road from Charlton to Gowganda, for which $50,000 has been appropriated. It is expected that the work of construction will begin in June.

The Ontario government has issued an order in council throwing open to prospectors 1,439,300 acres of land in Algoma district, lying north of Sault Ste. Marie. The land was set aside as a grant to the Algoma Central & Hudson Bay railway, about five years ago, and closed to all prospectors except those of the company. It is now declared open to all until Dec. 30, 1910, unless the company completes the road to the main line of the Canadian Pacific before that time. It is provided, however, that all discoveries of coal, iron ore, iron pyrites, or nickel ore belong to the railway.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

FAIRBANKS

A half million dollars is expected in the clean-up on 17 below on Goldstream. The property is worked on lays. Many other claims in this vicinity are making good, while the lode claims are coming to the front.

NOME

More than 20 good placer properties are showing renewed activity in this vicinity, with expectations of large gold outputs.

VALDEZ

Ellamar Copper—Operations were suspended some time ago because of the dangerous proximity of their main workings underneath the sea to the ocean floor. Regular work will be resumed after the completion of a cofferdam to keep the water of the ocean away from the working zone. The dam will be built under the direction of C. A. Middlekamp, superintendent.

Sunrise District—Julius Singer has purchased the Harry Ellsworth claims and will install a dredge with a capacity of 2000 yd. of gravel per day.

Moose Pass—Twelve miles from Mile 29 on the Alaska Central railroad is a new district containing placer and quartz. Free-milling gold quartz is also reported from Indian creek. Quite a stampede has occurred to Moose creek.

Matheson Brothers—The property near Hope is to be worked this summer with a steam shovel, a new experiment in placer mining in the Cook's Inlet country.

Alaska Central Railway—Bonds have been issued to the extent of $250,000 as a first lien on the property. The money will be expended in extending the railroad from Mile 52 to Mile 74.

Copper River Railway—The immediate construction of a branch to the coalfields is being considered to bring about their rapid development for commercial use. Two broad-gage locomotives were loaded in Seattle for shipment North, and upon their arrival train service will be inaugurated over 55 miles of road.

Arizona

Copper Production for March—The production of copper in Arizona for March amounted approximately to 27,070,000 lb., distributed by mines as follows:

	Pounds.
Copper Queen	8,500,000
Calumet & Arizona, Superior & Boston	4,300,000
United Verde	2,900,000
Old Dominion	2,970,000
Detroit	2,100,000
Arizona Copper	2,950,000
Shannon Copper	1,550,000
Imperial Copper	1,300.000
Miscellaneous	500,000
Total	27,070,000

COCHISE COUNTY

Calumet & Arizona—Four of the six furnaces are in operation.

Superior & Pittsburg—One of the largest orebodies in the Bisbee district has been opened on the 1200 level of the Hoatson shaft.

Copper Queen—Seven furnaces are in operation, and the April output is estimated at 8,500,000 lb. of copper.

Centurion-Arizona—Recent shipments to the smelter at Douglas are reported to yield 14 per cent. copper.

Leadville—While grading for the Mexico & Colorado railroad between Gleeson and Courtland, a body of carbonate ore carrying 7 per cent. copper was opened, at a depth of 12 ft. The deposit is said to be 50 ft. wide.

Shattuck & Arizona—A high-grade copper carbonate ore, 5 ft. thick, was opened recently on the 600 level.

GRAHAM COUNTY

Stevens Copper—A large amount of prospecting work has been done recently. Development work will begin soon.

MARICOPA COUNTY

Vulture—The first cleanup yielded 115 oz. gold bullion, valued at $1800. The large orebodies have been reëncountered on the 450-ft. level.

YAVAPAI COUNTY

Copper Chief—The large orebodies blocked out are crushing the old timbers, which necessitates retimbering many of the drifts and stopes.

Grand Island—The double-compartment shaft is now 100 ft. deep. Superintendent Wilson announces the early delivery of the new steam plant, with which sinking will be continued to a depth of 300 ft. A talc formation has recently been encountered accompanied by a heavy flow of water.

Arizona Power—The early delivery of electrical power will greatly stimulate mining in this district. The substation at Jerome is nearly completed.

Cleopatra Copper—Electrical machinery is being installed. A 12-drill, electric, Ingersoll-Rand compressor is now on the ground, and a 30-h.p. electric hoist has also been delivered. This hoist will be operated in the winze located 1200 ft. inside the Dillon tunnel. The ore consists chiefly of chalcopyrite and black oxide, occuring in a porphyrytic formation.

Butte & Verde—Messrs. Mulcaire, Bradley, Shea and others, of Jerome, have recently incorporated a group of 10 claims near Allen Springs, as the Butte & Verde Gold and Copper Company. Capital stock is $1,500,000, divided into 1,500,000 shares of the par value of $1 each. The property is partially developed by 200 ft. of tunnel.

YUMA COUNTY

Golden Star—The initial dividend of 1 per cent. was declared payable May 15. The milling facilities will be increased early in May.

California

AMADOR COUNTY

Plymouth Rock—Pritchard Brothers, lessees, near Plymouth, are extracting gold from the pocket recently discovered.

BUTTE COUNTY

Butte Creek—The power line from Centerville has been connected with this new dredge and active work on the gravel bed has commenced.

CALAVERAS COUNTY

Voinich—Ore has been found running $8 per ton and a 40-stamp mill is planned.

EL DORADO COUNTY

Prevolcanic Channel—After a partial suspension of operations for some weeks on account of stormy weather, work has been resumed with a large force. The gravel is cemented and must be milled.

FRESNO COUNTY

Arkansaw—At this property near Trimmer Springs, J. F. Ellwood vice-president, the miners are taking pay ore from the tunnel. There has been considerable snow in that section of late.

INYO COUNTY

Bishop Creek—Development on the oreshoot continues favorable. The sinking of another 100 ft. of shaft has commenced and three shifts of men have been set at work again.

MARIPOSA COUNTY

E. J. Mahoney, of San Francisco, has

purchased for Eastern men, the Rattler, Cold Springs, Hidden Treasure and half of the Lucky Strike, at Mountain King, on the Merced river in Hall's gulch. These claims will now be suitably equipped and developed.

MONO COUNTY

Bodie—The Syndicate mine and mill, under lease to the New Bodie Mining Company, is being worked on the leasing system. Goldfield men are about to begin operations on the Snowdrift claim. The Reading-Meagher properties are to be developed this summer.

NEVADA COUNTY

California Exploration Company—This company has bonded the old Nichols mine near Grass Valley and has commenced pumping out the old shaft. Oscar Coflin is manager.

Pittsburg—Manager Kerr has finally cleaned out the long drain tunnel and the water is flowing out that way. The main shaft has been partly cleaned out and retimbered.

Spenceville—There is a renewal of activity at this copper camp. C. C. Bittner and Otto Woehler are taking out excellent ore from their copper properties.

Native Son—The strike of rich ore at Blue Tent, a few miles from Nevada City, was in the main tunnel 800 ft. from the entrance. The mine was worked years ago, but was abandoned, and now Wisconsin men have taken charge of it.

Central Consolidated—At Banner Mountain, seven miles east of Grass Valley, in Nevada county, has showed up a valuable body of ore.

PLACER COUNTY

Orpheum—A new electric pumping and hoisting plant has been installed and a mill will shortly be put up. Chas. Peach is superintendent.

PLUMAS COUNTY

The drift mine on Spanish Peak, C. W. Fagg superintendent, has resumed operations after being closed down all winter.

SHASTA COUNTY

Esperanza—A new hoisting plant, air drills, etc., have been provided. The work of developing the property has commenced. A. J. Oswald is manager.

SIERRA COUNTY

Chipps—At Sierra City a new vein has been found carrying exceptionally high-grade ore.

SISKIYOU COUNTY

Scott River Dredging Company—This company is now handling a large amount of gravel with the new dredge.

TUOLUMNE COUNTY

Little Bonanza—This mine, near Sonora, has been leased to C. P. Curnow, Jr., and D. G. Peters has been appointed superintendent. A 20-stamp mill is to be erected on the property and the mine worked on a large scale.

Tarantula—After testing their ores the company owning this mine near Chinese has decided to install machinery.

United Mines Company—All differences have been settled, the claims paid for, and work has recommenced.

YUBA COUNTY

Northern Gold Mining Company—Organized at Marysville to work certain claims at Brownsville. The principal owner is J. E. Coulsen, of Goldfield, Nevada.

California Mother Lode Mining Company—W. C. Wilkins, president, is about to start work on the mines at Indiana Ranch. A compressor is to be purchased and a cyanide plant built. The mill will be enlarged to 20 stamps.

Colorado

BOULDER COUNTY

John Jay—It is announced that J. A. Reynolds, of Chicago, and associates have purchased this mine at Jamestown and will erect a cyanide mill.

CLEAR CREEK COUNTY

Gambetta—A carload of high-grade zinc ore, also carrying about 40 oz. silver per ton, was recently shipped from this property on Republican mountain.

Mendota Mines—The Mendota mill in the upper Clear Creek district is being operated three shifts and the company is marketing monthly from 50 to 60 tons of lead concentrate and 30 to 40 tons of zinc concentrate, as well as about 200 tons of an intermediate iron product.

Seven-Thirty—Arrangements are being made by George Tarkington, manager, to unwater the shaft and undertake exploratory work.

Terrible—Wood & Co., leasing on the 14th level of this mine on Brown mountain, are obtaining a good tonnage of lead-zinc ore for concentration. Recently a vein of high-grade silver-lead ore from 10 to 20 in. wide was encountered and ore from same is being shipped. Work is also being done in the mine on company account.

TELLER COUNTY

Delmonico—Shipments are being made from the high-grade ore recently encountered on the 300-ft. level of the property on Bull cliff.

Tornado—Humphreys & Thompson, leasing on this mine on Raven hill have been sending out smelting ore for several weeks. The mine is owned by the Elkton Consolidated Mining and Milling Company.

EL PASO COUNTY

United States Reduction and Refining Company—At the annual stockholders' meeting the following directors were re-elected: J. Dawson Hawkins, C. M. Mac Neill and Spencer Penrose, of Colorado Springs; H. M. Blackmer, H. A. Dubbs and K. K. MacLaren, of New York, and J. Q. MacDonald, of Florence, Colo.

Idaho

LEMHI COUNTY

Weimer—W. B. Andrew and associates, of Salt Lake City, have taken a two-year lease on the mines on Birch creek. This property formerly shipped 14 to 18 per cent. copper ore, shipment being made via DuBois, after a wagon haul of about 50 miles.

Indiana

CLAY COUNTY

The joint board of miners and operators of the Block coalfield held a meeting April 16 and took up the grievances that occasioned the calling out of 50 men at the Mary mine. The trouble arose over the introduction of machines and the selection of 12 picked men to operate them, leaving 36 men idle. The mine owners proposed to give all of the men an equal share of the work in the mine; the proposition was accepted and the work was resumed April 26.

The board settled another matter which has been causing friction in this district for some time. The chief complaint grew out of the discharge of a cager in a mine of the Progress Coal Company, where, because of work being slack, the man was displaced by the mine superintendent, who looked after other duties. The displaced man was offered another position in the mine, but refused to accept it. The joint board sustained the position of the company, and the men were ordered back to work.

Michael C. White, superintendent, and Thomas Maxwell, mine boss of the Vivian Bogle mine were brought into court charged with failure to keep stretchers and blankets at the mine for use in case of accident, and with driving entries beyond a distance of 45 ft. without cutting a breakthrough. Both men entered pleas of guilty to violating the law in these charges and were fined.

GREENE COUNTY

Keystone Coal and Mining Company—A new shaft is being sunk near Howesville, two miles east of Jasonville. The company has had an option on several hundred acres of coal land in Greene county for two years. The coal from the new mine will be hauled out by the Monon road by a switch to be completed soon.

The work is supervised by Johnson Carmichael.

VIGO COUNTY

Glen Ayr Coal Company—This company, controlled by John Freeman and David Ingle, is opening a mine six miles east of Terre Haute on the main line of the Vandalia railroad which will be put in operation June 1. The mine will have a capacity, when fully developed of 1000 tons daily, and will employ nearly 200 men. The mine will be known as Glen Ayr No. 2; No. 1 being a short distance from the new mine. The tipple for the new mine has been completed.

Michigan

COPPER

Lake—A crosscut has entered the formation and drifting north and south on this lode is under way, with the face of either drift showing the same characteristic richness that has been in evidence in other openings.

North Lake—The Lake lode was tapped with a diamond drill in the No. 3 hole.

Challenge—This property, under the management of the St. Mary's Mineral Lands Company, continues to carry on exploratory work without any material change in conditions. The shaft is about 800 ft. deep. A diamond drill is also operating at this point to ascertain the copper contents of the formation at depth.

Calumet & Hecla—An electrically operated hoisting plant has been installed at the slope shaft, 3000 ft. from the 57th level of Red Jacket shaft, and will work the ground adjoining the Tamarack, Jr., property. The shaft is down 2200 ft., at an angle of about 23 degrees, cutting across the face of the lode. The rock coming from this shaft will be hauled to Red Jacket shaft through which it will be hoisted to surface.

Franklin—Drifting is under way on the Pewabic lode at three different points from No. 1 shaft on the 23d, 24th and 25th levels. In all these drifts first-class ore is being exposed. A crosscut to cut the lode at the 26th level is also under way.

Keweenaw—Work will be discontinued soon on the Medora shaft and all activities centered in opening on the Kearsarge lode.

Copper Range—Extensive trenching operations will be carried on in conjunction with the three drilling outfits on the lands held under option from the St. Mary's Mineral Land Company.

Tamarack—No. 1 shaft is being equipped with two large steam pumps, one at the 500-ft. level and the second at the 900-ft. level. These pumps will handle the water coming into the shafts, No. 2 and No. 5, and will eliminate the water hoisting at No. 5 shaft.

Adventure—Preliminary work prior to beginning the sinking of a new shaft to open the copper-bearing formations that were exposed in the drill cores is under way. This shaft will be south of No. 3 shaft and in a position to command the ground tributary to the three new formations.

Isle Royal—The new high-duty hoisting plant at No. 6 shaft is in commission, using a 7-ton skip. The new shaft on the Baltic lode is down about 350 feet.

Mass—Drifting on the newly opened amygdaloid formation continues with no change in the grade of the ore. The formation at the point of intersection with the crosscut is about 12 ft. wide and assays taken show about 92 lb. of copper to the ton. The copper is evenly distributed throughout the entire face of the lode. This lode was first exposed by a drill core which cut it about 100 ft. below the point it is opened by the crosscut from the 17th level.

Michigan—The copper-bearing lode that was recently opened in the old adit on the Bee tract of this company is holding out great encouragement for its ultimate success. The formation carries a good grade of stamp rock.

Minnesota

IRON—MESABI RANGE

Great Northern Iron Ore Properties—The trustees of these properties, which include the greater part of the northern section of the Mesabi, report that the tonnage mined by operating companies was 3,281,061 tons in 1907, and 1,468,925 in 1908; a decrease of 1,812,136 tons. On the properties leased to the Great Western Mining Company—the subsidiary of the United States Steel Corporation—exploration was prosecuted with vigor with continued satisfactory results. A monthly average of 77 drills has been maintained, as against the 40 required by the terms of the lease. Exploration work has been completed on about 3600 acres of the leased lands. None of the properties covered by the lease to the Great Western Mining Company was put on a shipping basis during the year. Development work, consisting of surface stripping to the extent of approximately 3,500,000 cu.yd. and the construction of yards, tracks, etc., has been conducted on several properties at large expense and in a manner to prepare these properties for mining and shipping large amounts of ore. The expenditures amounted to about $3,000,000. The total receipts of the trustees were $1,749,214; expenses, $75,390, and dividends, $1,500,000, leaving a surplus of $173,824 for the year.

The tonnage tax bill, providing for a tax on iron mines based on the tonnage produced, was passed by the Legislature, but vetoed by Governor Johnson. He took the ground that the present system of taxing iron-ore lands had proved satisfactory, and that the further imposition of a tonnage tax would be unjust, putting an inequitable burden upon the owners of iron lands. The bill failed to pass over the veto.

Montana

BUTTE DISTRICT

Butte-Montana—A spur from the Great Northern Railway is being run to the company's Alex Scott mine. About 100 tons of first-class ore, and the same amount of second-class is in the bins ready for shipment.

Amalgamated—A new shaft is being sunk on the Modoc Extension claim, of the Anaconda company. The claim is directly north of the Boston & Montana company's West Colusa mine.

JEFFERSON COUNTY

Corbin-Wickes—It is reported that a company is in course of organization in Boston for the purpose of acquiring the outstanding stock of this company. A total of 115 acres is owned or under control. The new company will have a capital of 150,000 shares of a par value of $5 each. It is expected that active mining will begin as soon as additional machinery is installed.

PARK COUNTY

Bear Gulch Placer Mining Company—An action has been instituted against the Kimberly-Montana Gold Mining Company, for the purpose of restraining the latter company from interfering with the water used in a certain ditch near Jardine, Park county. The plaintiff also requests that the court quiet its title to the water right and ditch in question.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Atlanta Cherokee—Two strong quartz ledges have been encountered on the 530-ft. level showing a small amount of gold. Plans have been made to sink to greater depth.

Grizzly Bear Lease—A new 75-h.p. hoist is to be installed. It is expected that the shaft, now 400 ft. deep, will reach the Clermont vein at a depth of about 475 ft. The lease has recently changed hands and is now controlled by W. E. Dowlen, of the Nevada Reduction Company.

Gold Bar—Shipments are maintained at the rate of one carload a week. The ore is said to run $65 to $100 per ton.

Goldfield Belmont—This property adjoining the Daisy in the Diamondfield section is preparing to resume shipments. A good grade of ore has been encountered on the 400-ft. level.

Blue Bull—A shipment of five tons was made from the Knickerbocker lease last week. The vertical shaft has been sunk

to a point 100 ft. below the tunnel level and a crosscut started toward the orebody 32 ft. distant.

Florence Goldfield—A strike was made April 10 on the 200-ft. level of the main Florence vein. The stope just started shows a width of 12 ft., 3 ft. of which is high-grade ore, the remaining 9 ft. being milling ore.

ESMERALDA COUNTY—HORNSILVER

Great Western—The winze from the 300-ft. level, now 35 ft. deep, has developed 15 in. of good ore. In the west drift on the 300-ft. level, 3½ ft. of ore is exposed. The first shipments contained 300 oz. silver to 1 oz. gold. The ratio at present is about 30 oz. silver to 1 of gold. Three carloads a week are being shipped.

ESMERALDA COUNTY—HAWTHORNE

Goldfield Alamo—The Hubbard lease has declared a second dividend of $50,000. The shaft is now 410 ft. deep. The silver content is increasing while lead is diminishing.

ESMERALDA COUNTY—LUNING

Taft—Well defined veins running northeast and southwest, which carry gold, silver and copper, have been discovered. Much work has been done on this property.

Rawhide Western Railroad—The proposed road will give outlet to the east of Rawhide, as well as aid the Fairview and Lodi districts, which have a large tonnage of ores.

ESMERALDA COUNTY—RAWHIDE

Sunbeam—This property has been shut down for a long time owing to legal matters, but has lately been acquired by San Francisco people and is now running regularly. Sulphide ores, carrying gold, have been encountered on the 190-ft. level.

Prosky Reef No. 1—A rich vein has been encountered and is now being farther opened up to determine the extent of the orebody.

Townsite Leasing Company—W. B. Wedell, of Ogden, Utah, is sinking a new shaft near the vein of the Nugent lease; this firm also operates the Kerns No. 1 lease and the Townsite lease No. 1. On the Nugent property last week a new vein was opened up on the lower level.

Victor—The Goldfield leasers have enough ore in sight to build a 10-stamp mill. It will be erected near the shaft and material has been ordered.

King-Heisner—The machinery and lumber for the 75-ton cyanide mill have been coming in regularly by teams. All of the grading and a great deal of the pipe lines have been completed, including the water tank which is to assist in the water supply of the town. This mill is to be the most complete in the district and is expected to be in operation by June 1, 1909.

LANDER COUNTY—AUSTIN

Austin-Manhattan—The old tunnel which penetrated Lander mountain a distance of 6000 ft. has been cleared and retimbered to the breast. A station is now being cut at its intersection with the Frost shaft, and on arrival and installation of the hoist, the shaft will be sunk to the 1100-ft. level. The compressors are now in place and are capable of supplying 25 power drills. Work will start immediately on the clearing and retimbering a crosscut from the tunnel 2800 ft. long.

LINCOLN COUNTY—PIOCHE

Jack Rabbitt—The crosscut on the 700-ft. level of the Day mine has penetrated ore nearly 400 ft. About half of the ore contains 15 oz. of silver per ton. The same body of ore was encountered on the 600 and 800 levels. The company is now shipping about 60 tons per day.

Mendah-Nevada—About 200 tons were shipped during March. This is principally the ore taken out in development. The shaft has reached the 900 level and the station is being cut.

Pioche King—A new 50-h.p. Alamo hoist with Franklin compressors has just been installed. The property is about two miles southwest of Pioche near the Prince Consolidated Mining Company. The shaft is 50 ft. deep.

NYE COUNTY—BULLFROG

National Bank—The Logland lease has another shipment ready for treatment. The ore is being extracted from the incline between the tunnel and the surface.

NYE COUNTY—PIONEER

Bullfrog Pioneer—This property is now shipping between 75 and 100 tons daily. The compressor and five drills were started April 14, and three additional drills are *en route* to the property.

Mayflower—The report, covering operations for March shows a net profit of $7000 from the five-stamp mill, 365 tons of $30 ore being treated during the month. The best ore yet encountered is exposed in the raise from the 300-ft. level. Development work has also been started on the 400-ft. level.

NYE COUNTY—ROUND MOUNTAIN

Lehigh Antelope—A mill run of 156 tons of ore was made last week from which over 1000 oz. of bullion were recovered, worth slightly in excess of $12,000.

NYE COUNTY—TONOPAH

Tonopah Mining—The diamond drill has struck ore at a depth of 1600 ft. The Mizpah shaft is now being sunk to catch the ore on that level.

West End and Tonopah Extension—A mill is to be erected to treat the ore from these two mines.

MacNamara—The regular monthly dividend of 1c. per share was declared payable May 5. Last week 300 tons of ore were shipped. The shaft is now 710 ft. deep.

Oklahoma

OTTAWA COUNTY

Miami—That this camp is in a prosperous condition is shown by the fact that of its nine mills all are in operation. These are the Emma Gordon, Golden Hen, Queen City-Joplin, Miami-Yankee, New State, King Jack, Index, Dan Isley and Swastika. The Tom Lawson ground was forfeited and the mill has been removed. The Old Chief mill burned down and the Indianola Mining Company, which was operating the mine, refused to rebuild the mill on a 30-per cent. royalty and has given up the lease.

The Wanhilla is building a mill and will soon be operating. The Turkey Fat, whose ground was developed from the Tom Lawson, is sinking a shaft and will build a mill at once.

On the Sullivan lease one shaft is in ore and another is being sunk to the ore developed by the Old Chief. A mill will be built as soon as this shaft is completed. The Emma Gordon has completed a shaft 1000 ft. north of the mill and has contracted the building of a tram to the mill. This will make four shafts connected with the mill. This company has just made a rich strike of ore in a deeper run northwest of the mill. In spite of the fact that nearly all the companies are operating under third and fourth leases at the outrageous royalties of 25 to 35 per cent. the camp is progressing.

Oregon

LANE COUNTY

Bohemia District—An exhibit of representative ores for the Alaska-Yukon-Seattle fair is being gathered and will be exhibited in Cottage Grove for a time before it is shipped to Seattle. The specimens collected to date from Bohemia mines embrace gold, silver, copper and galena. Many of the gold specimens show free gold in abundance.

Oregon Mineral Paint Company—This company, with mines situated four miles north of Cottage Grove, Ore., has purchased three acres of ground at St. Johns, near Portland, and will erect a paint plant. This will give employment to a large number of men at the mine. The raw mineral will be hauled over the Southern Pacific railroad, a distance of 148 miles from mine to the plant.

Kelso—W. P. Ely, secretary, will have men put to work on the new plant which was started last fall, and was shut down on account of deep snow.

Combination Mines—R. H. Clark and Sherman Clark have purchased a large amount of supplies for their milling plant, part of which is on the ground.

Golden Rule—R. L. Ormsby states that his company intends to install its milling plant this spring. Work has been in progress at the mine all winter.

South Carolina

YORK COUNTY

A tract of 1500 acres of land containing deposits of manganese has been purchased by H. F. E. Gamm, of Rutherford, N. J. The ore is reported to contain 51 to 60 per cent. manganese, and ½ per cent. phosphorus.

South Dakota

LAWRENCE COUNTY

Speculation is rife regarding the revival of tin mining. There seems little doubt that tin exists in the Tinton district of the Black Hills, though no extensive development has been done. Milling on a small scale has been carried on, but in order to make the operation a paying one a large tonnage and modern concentrating machinery are essential.

Hercules—Grading is about completed for the 40-stamp cyanide mill under construction, and the foundations are being put in. The mill is expected to be in operation this fall.

Altia—The work of unwatering the mine, until recently known as the Puritan, is now under way.

Golden Crest—The mine has been unwatered below the 125-ft. level, where the workings were found in good condition. The new mill is expected to be in operation by June 1.

Utah

SALT LAKE COUNTY

Bingham Mines Company—The Dalton and Lark mines have recently been operated by leasers who have been shipping lead-silver ores. In view of the completion of negotiations for acquiring title to the mines formerly belonging to the Bingham Consolidated Mining and Smelting Company, preparations are now being made to operate these mines more extensively.

Columbus Consolidated—Ore is now being shipped to the Pioneer sampler at Sandy. As soon as possible the shipments will be increased to 100 tons per day. The upraise from the 400-ft. level is about 100 ft. in ore. The width of the orebody is about 40 feet.

Kennebeck—A compressor has been purchased and will be installed as soon as the snow is off the ground.

South Columbus—Ore has been encountered in a winze 70 ft. below the tunnel level in the eastern part of the property. Sinking is to be continued 30 ft. farther.

SUMMIT COUNTY

Ontario Mine—Arrangements are being made for the driving of a tunnel from the 600-ft. level which will tap the Wabash at a depth of 800 ft., the New York at a depth of 1000 ft. and the Nail Driver at a depth of 1100 feet.

JUAB COUNTY

Yankee Consolidated—The power plant which was disabled, owing to the presence of acid in the water, has been repaired and the company is continuing its development work.

Tintic Volcano—The new shaft is now about 60 ft. deep. The property flanks that of the Tintic Standard on the east.

Iron Blossom—A 15-drill Ingersoll-Rand compressor has been purchased to provide the mine with independent power. Compressed air is now being obtained from the Colorado mine, but the development of the Iron Blossom and the possibility of the sale of the Colorado mine and Tintic smelter have apparently made it desirable to be independently equipped. The stock of the company has recently suffered a severe decline on the Salt Lake Exchange.

Uncle Sam Consolidated—A winze recently opened a large body of ore that is said to carry 50 per cent. lead with a fair silver and gold content. It is expected that regular shipments will be resumed as soon as suitable smelting arrangements can be made.

Washington

ASOTIN COUNTY

West Coast Portland Cement Company—This company recently installed a complete experimental plant at Asotin, to thoroughly test the merits of the cement-making raw materials with a view of installing a plant of large capacity.

SNOHOMISH COUNTY

Wayside Mine—The vein encountered by the tunnel is equal to expectations. The Atlas Corporation, which owns this property, was so badly in debt that it passed into the hands of a receiver. The staunch men of the corporation advanced a substantial sum for development work, and this was carried out under the management of Receiver Edward Hawkins. All of the obligations of the Atlas Corporation are paid.

Wisconsin

ZINC-LEAD DISTRICT

Benton—The Calvert property has been taken over by Wm. N. Smith and associates; a 75-ton mill will be provided. The mine is opened up by 100 ft. of drift, showing heavy sheet jack; the pitch is crosscut 40 ft., carrying a 30-ft. stope. A 12-ft. vein of sheet and disseminated jack has been penetrated by shaft on the Fields land, five miles southeast of Benton, by Robert W. Hunt & Co. The shaft is completed at 184 ft.; the range is proved a quarter mile by drilling. The Lucky Twelve Mining Company will place machinery equipment on its prospect just north of the Fields; a rich deposit of jack is proved by shaft and drill at 130 ft. The Fox Lead and Zinc Company has obtained siding facilities from the Northwestern railway, and is building an aërial tram to load its ores direct on cars; the mine is turning out from four to six cars of zinc concentrates weekly.

Canada

BRITISH COLUMBIA—CARIBOO

Preparations are being made for the opening of the placer gold-mining season. Gravel washing is usually commenced during May of each year, and the indications are that it will be practicable to get the water running in flumes and ditches by the middle of that month.

BRITISH COLUMBIA—PEACE RIVER

The provincial government is sending F. C. Campbell, for many years mining recorder at Trout lake, Lardeau district, to the Peace river country. This big district is being made reasonably accessible by the construction of the Grand Trunk Pacific railway. As the occurrence of gold and coal in it have both been repeatedly reported, Mr. Campbell will be gold commissioner for the district, as well as official representative of the government in other departments.

NOVA SCOTIA

Dominion Iron and Steel Company—Owing to the favorable settlement of the litigation with the Dominion Coal Company, the directors decided to adopt a liberal policy as to dividends. A cash dividend of 10½ per cent. was declared on preferred stock payable May 10, toward clearing off arrears, which will leave dividends for 4½ years amounting in all to 31½ per cent. still due. It is proposed to clear off the balance of accumulated dividends as rapidly as the income will permit, devoting to that object all further moneys received on the claim against the Coal Company. The total claim for damages is placed at $3,951,092, which, deducting the $2,750,000 received on account, leaves a balance of $1,201,092 to be paid.

ONTARIO

Lake Superior Corporation—Subscriptions were received by the Bank of Montreal in Montreal and London from April 14 to 19, for $5,000,000 first mortgage collateral trust 40-year 5-per cent. bonds, part of the issue of $10,000,000 dated 1904, of which about $9,000,000 have long been outstanding, but largely held by the Canadian Improvement Company. These bonds are a first charge upon certain landed property of the corporation and, directly or indirectly, on all of the stock and bonds of the subsidiary companies. The proceeds of the bonds are to be used chiefly for improvements and additions to the works at the Sault Ste. Marie.

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore from Cobalt for the week ended April 17 were

as follows: Buffalo, 60,930 lb.; Chambers-Ferland, 60,000; Coniagas, 63,615; Crown Reserve, 119,480; La Rose, 485,468; McKinley-Darragh, 66,900; Nipissing, 130,240; Right-of-way, 150,680; Temiskaming 60,200; total 1,197,513 pounds.

Chambers-Ferland — The raise which was run to the surface of this property by the Right-of-way mine is now in operation. An air line has been laid to the mouth of the shaft and a drill put to work on La Rose vein. Stoping is being undertaken on the main vein on the 150-ft. level of No. 1 shaft.

Foster—The company has entered into an arrangement with the Argentum Mines, Ltd., by which the latter company is to operate the Foster mine for five years in connection with its own mine.

Green-Meehan—In accordance with the decision of the shareholders, a transfer of the assets of this company has been made to the Consolidated Silver Cobalt Mines, Ltd.

Kerr Lake—S. R. Heakes, manager, states that the company is limiting its output to two tons of ore per day, and that for each ton mined three to four tons are being put in sight. The total cost of production, including everything, is 7c. per oz. of silver. The average of this year's shipments has been 3300 oz. silver to the ton.

La Rose—This company has acquired the Lawson property, which has been for a long time in litigation, taking over the outstanding shares of the Lawson mine, Ltd., in exchange for its own stock. Surface prospecting and development work on the Lawson will be begun immediately.

Silver Leaf—Another small vein about 2 in. in width, carrying native silver, was recently struck in drifting toward the Foster and is being followed up. The present force consists of 16 men and two drills.

Crown Reserve—A financial statement covering the first three months of the present year has been issued, showing a surplus at the end of March of $437,302. Ore was shipped to a total net value of $452,405. The company paid $45,779 for operating expenses, spent $10,949 on plant, and paid $40,168 royalty to the provincial government. Out of the balance $256,322 was paid in dividends, leaving a surplus of $90,185. General Manager Cohen states that at the depth of 75 ft. in the west winze below the 100-ft. level the vein is strong and yielding rich ore. A winze is being sunk at the east end of the same vein which will block out ore on three sides. In prospecting crosscuts during the last three months eight veins have been cut, three of which are from 3 to 4 in. in width with rich ore, the other five running from 1 to 1½ in. wide, with good silver contents.

ONTARIO—SOUTH LORRAINE DISTRICT

Haileybury—This company has sold 20 acres, being the southern part of its property, to C. M. Ehrlich, New York, and H. G. Wood, Buffalo, for $100,000.

QUEBEC

McDonald Copper Mine—The Eastern Canada Smelting Company has bought this mine, which is in Weedon township, Wolfe county, near the Quebec Central railway.

Mexico

CHIHUAHUA

Dolores — The February production amounted to $79,000, of which $29,000 is reported as profits. According to estimates the March output was slightly in excess of this.

Rio Plata—The new cyanide plant will be in commission soon. The manager, D. W. Shanks, accompanied by President Miller and others from New York, recently inspected the property.

Dos de Abril—The Huizopa Mines Company has succeeded the Dos de Abril Mining Company. The officers of the new corporation are arranging for the resumption of work on a larger scale. The home office of the company is at Cleveland.

Candelaria—This company, operating in the San Pedro camp, is shipping about six cars of lead ore daily. Other active properties in this camp are the Cinco de Mayo and Durack.

Parral Output—The production of the Parral camp for the week ending April 9 was 10,120 tons, as compared with 9410 tons for the week preceding. The district, particularly in the Santa Barbara section, is showing constant improvement.

Republica—It is officially reported that the first dividend will be paid during the month of May. The property is maintaining a steady production from its cyanide plant. Lately explored orebodies insure a large tonnage of 100-oz. silver ore. J. Gordon Hardy is consulting engineer and manager.

Santa Mathilde—J. W. Cowan and associates of Tennessee have taken a bond and lease on this and adjoining claims situated in the Dolores district, near the Sinaloa line. A three-stamp mill, concentrator and small cyanide plant have been ordered from San Francisco. The ores are gold and silver with the gold predominating.

GUANAJUATO

Guanajuato Consolidated—Report for March: The mill ran 29 days. Estimated value of concentrates, $41,000; total gross value in products, $93,000; less working expenses, including marketing of bullion and freight and treatment charges on concentrates shipped to smelter, $69,050; estimated profit, 23,950 pesos. Of this 11,700 pesos were expended on development account; amount of development work done, 345 feet.

JALISCO

Cinco Minas—H. E. Crawford has an option on these mines for $520,000. The first payment of $50,000 has been made.

Amparo—The second quarterly dividend of 2½ per cent. will be paid May 10. The mine entered the dividend list last February.

OAXACA

Mimiaga—The discovery of a new and rich orebody is reported.

SINALOA

San José—Francis Breuil has installed a two-stamp mill on the San José gold mine near Palmarito, and is now developing the mine.

Los Tajos—Engineers representing D. M. Barringer and associates, of Philadelphia, recently examined this and the Mina Grande mine in the Santiago de los Caballeros district.

Palmarito—A small force of men is working in the mine, pending the successful solution of trouble with the mechanical roasters in the lixiviation plant. C. Dupree Smith is now in charge of the work.

West Coast—The concentrating plant, situated in the Los Tajos district, is producing high-grade copper concentrates, which carry some gold and silver. Additional machinery and equipment has been ordered from Denver, which will double the present capacity of the mill. A vertical shaft is being sunk on the Rio mine to cut the vein 235 ft. below the present working tunnel. The shaft is being sunk with hammer drills. A hoist and equipment has been shipped for use on this shaft.

San Antonio—The bond and lease which was held by Southern Pacific interests, on the San Antonio and Estrella del Norte mines, situated in the Las Chivas district, expired March 20. The mines are owned by Castro Brothers and Jesus Imesquita. The option will not be renewed.

Jesus Maria—The February output was 120 kg. of gold bars, assaying about 700 fine.

Rosario—Situated near the Jesus Maria mine in the San José de Gracia district is working about 100 men and is producing a good milling grade of ore. Notwithstanding the death of Antonio Echavarria, the discoverer and one of the principal owners, the usual shipments of bullion are being made.

Toro Bueno—Edward Cook has taken an option for 18 months on this mine from Serapio Lopez and associates. The purchase price of $50,000 is payable in four payments, due in 3, 6, 12 and 18 months. Work was started at once on the mine and the force is being increased.

ZACATECAS

San Roberto—Since the South African company began operations, the output is $20,000 to $30,000 per month.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, April 28—Coal-trade conditions in the West show little change. The demand for steam coal continues to improve slowly, but domestic trade is off. The Lake trade has hardly begun, and is held back by the current dispute over rates from the mines to Lake Erie ports; and also by the delay in starting ore shipments, which makes the offerings of tonnage light. A late opening is looked for; meantime stocks of coal on Northwestern docks are gradually disappearing, although no scarcity has yet been felt.

The anthracite situation is still an open one. Conferences have been held between the operators' committee and the representatives of the miners. The current report is that the miners have agreed practically to renew the old agreement for three years with a few unimportant modifications, which are nominal rather than actual concessions. The whole mater is before a district convention at Scranton, which is now in session, and it is not altogether safe to predict the result. All that can be said is that present chances seem to be against a strike, but a positive statement will not be safe until the agreement has been signed.

The Seaboard bituminous trade is in a disturbed condition, owing to the action of the West Virginia railroads and operators in making rates on coal delivered at the seaboard at prices which imply an exceedingly low freight rate. How long this condition will last is uncertain. An important point is that the Pennsylvania Railroad Company has purchased the large block of stock of the Norfolk & Western which it sold over two years ago. This purchase will give the Pennsylvania once more a controlling voice in Norfolk & Western affairs and will doubtless lead to some adjustment of coal rates. Reports, however, which were started from Philadelphia, have it that the new Virginian railway and the Chesapeake & Ohio will continue to make low rates. The Virginian road, it is said, intends to secure as large a share as possible of the bituminous coal trade with a view to concentrating that trade. These reports recall the rumors of a bituminous coal trust on a large scale which were current five or six years ago and must be accepted with caution—except insofar as that the Virginian people are doubtless out for all the business they can get.

The Hocking Valley Combine—The Circuit Court at Columbus, O., has decided that the holding of coal-company stocks by the Hocking Valley Railroad Company is in contravention of the State law; also that the proposed combination with the Kanawha & Michigan and other roads is contrary to law, as they are parallel and competing lines. The case is to be carried up to the Supreme Court on appeal.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to April 17, short tons:

	1908.	1909.	Changes.
Anthracite	1,565,811	1,511,243	D. 54,.68
Bituminous	9,848,588	10,411,529	I. 562,941
Coke	2,089,664	2,936,925	I. 847,261
Total	13,504,063	14,859,697	I. 1,355,634

Increase for the week, 202,233 tons. Total increase year to date, 10 per cent.

Shipments reported by Southwestern Interstate Coal Operators' Association, month of January, short tons:

	1908.	1909.	Changes.
Missouri	247,103	252,264	I. 5,161
Kansas	570,351	534,219	D. 36,132
Arkansas	228,052	135,399	D. 92,653
Oklahoma	313,952	213,807	D. 100,145
Total	1,359,458	1,135,689	D. 223,769

The total decrease this year was 16.5 per cent.

Coal receipts at Boston, three months ended March 31, reported by Chamber of Commerce:

	1908.	1909.	Changes.
Anthracite	389,904	362,541	D. 27,363
Bituminous	824,000	788,633	D. 35,367
Total domestic	1,213,904	1,151,174	D. 62,730
Foreign	142,350	76,835	D. 65,515
Total	1,356,254	1,228,009	D. 128,245

The foreign coal is chiefly from Nova Scotia mines.

New York

Anthracite

April 28—Business is going on quietly in hard coal, although the dispute between miners and operators is not yet settled. Buying on the April discount has been rather large. No announcement has yet been made as to the May discount and it is not quite certain whether it will be made. It probably depends on the result of this week's conference between miners and operators.

Prices on domestic sizes are $4.25 for lump and $4.50 for egg, stove and chestnut, f.o.b. New York harbor. Prices on steam sizes are a little unsettled, as demand is rather in excess of present supply. Current quotations are $3.10@3.25 for pea; $2.35@2.50 for buckwheat; $1.70@2 for rice; $1.25@1.50 for barley, f.o.b. New York harbor.

Bituminous

The Seaboard coal trade is disturbed by the action of the West Virginia operators, who are evidently trying to secure business even at low prices. Thus Pocahontas has been offered as low as $2.15, f.o.b. Lambert's Point, and prices to correspond have been made on New River, f.o.b. Newport News. In their search for trade some West Virginia operators have even offered to make delivered prices at Eastern ports, a practice which was abandoned three or four years ago by general consent; its revival will be witnessed with regret by most dealers.

In current trade buying does not seem to have been revived by this competition. The far East is taking occasional cargoes, but is still dull and sleepy. Along the Sound a small but regular business is noted. New York harbor is doing a little business, but cannot be called active. Prices remain about the same as last week and buyers seem to be waiting the result of the West Virginia action. All-rail trade is fairly active. Car supply is abundant but transportation is a little slow.

In the Coastwise vessel trade boats are still rather scarce, owing to the weather. Rates on large vessels from Philadelphia are nominally unchanged, but smaller vessels are getting an advance of 5 to 10c., making the freight from Philadelphia to Boston about 65c. In New York the smaller vessels are asking from 10 to 15c. more than a week ago.

Birmingham

April 27—The Southern coal market shows a little improvement but it is slight. Little labor has left the district, so confident are the miners that there will be a resumption ere long. The improvement in the coke demand has caused a steady output at a larger number of ovens. It is believed there will be a good demand for coke all through the summer. Some of the larger companies are still stocking coke for future use.

The Star Cahaba Coal Company, with small mines in Shelby county, is in litigation, a petition in bankruptcy having been filed, and a receiver being named.

Chicago

April 26—The coal market continues quiet, with fine coals more and more in demand and lump correspondingly difficult

to sell. There is little demurrage trouble; shipments, speaking generally, are fairly well adjusted to the demand. Hocking Valley coal has been somewhat in overabundance, and occasionally Illinois or Indiana lump has to be sacrificed to be unloaded. Domestic coals are very weak, except anthracite, Contract making is increasing and is in general at low prices. Competition in this as in the open market is keen, and to get hesitating users of coal prices are cut.

Lump and egg from Illinois or Indiana mines sells for $1.75@2.25; run-of-mine for $1.65@1.75, and screenings for $1.40@1.60.

Eastern coals are stronger as general business conditions improve. Smokeless, well held down as to shipments, brings $3.20@3.45 for lump and $2.95@3.15 for run-of-mine. Hocking Valley sells for $2.90@3.15 and is somewhat sluggish. Youghiogheny at $3.15 for ¾-in. gas and Pittsburg No. 8 at $2.75 for ¾-in. lump are quiet. In the anthracite market something of the briskness apparent is attributed to the lack yet of warm weather, but there are evidences that the average retailer and consumer are laying in supplies early to get the benefit of the spring discounts.

Cleveland

April 27—The coal market is still stirred up over the question of rates on Lake coal. Until that is settled, and until ore begins to move, there will be little coal started up the Lakes.

The local market is quiet and unchanged with possibly a little better demand for steam coal, but no change in prices. Some slack has been sold at a slight advance, as that grade is in light supply.

Indianapolis

April 26—The showing of the leading mining companies of the State for the past week indicates a gradual increase in the output. The orders taken during the past week have caused firmness in the market, although prices remain at a low level. Shops, railroads and power houses are increasing their weekly orders. There is also a manifest confidence in the Indiana coal industry by the several new companies that are sinking new mines, while a number of old companies are making extensive improvements.

Pittsburg

April 27—Production at the railroad mines has increased materially during the past week, the additional tonnage going to Lake ports for shipment to the Northwestern markets. There is also an increase in the local demand, but prices are low. Sales under contract have been made within the past few days at around $1 per ton for mine-run coal at mine. Large producers are still endeavoring to hold the price at $1.15, but the bulk of the business is going at $1.10. Slack remains at 55@65c. The river mines continue to operate at capacity and a large tonnage is accumulating. The rivers until today were at a good barge stage, and several million bushels went out on the rise. It is estimated that about 60 per cent. of the capacity of the railroad mines is being brought out.

Connellsville Coke—Conditions in the coke trade continue bad and some sales of furnace coke for spot shipment are made at as low as $1.40@1.50. On contract to July 1 the asking price is $1.60. One or two large contracts for shipment through the second half were made lately, but the price is not given. Producers are quoting $1.75 for the last half. Foundry coke also is down, $1.85 and less being done for spot shipment. On contract the asking price is $1.90@2.10, but some producers are holding for $2.25 for late delivery. A number of ovens have been closed during the week and production generally is being curtailed.

The *Courier* gives the production in both fields at 233,151 tons. The shipments were 9127 cars, as follows: To Pittsburg district, 3511 cars; to points west of Pittsburg, 4726 cars; to points east of Connellsville, 890 cars.

Foreign Coal Trade

Coal in Peru—The production of coal and lignite in Peru in 1908 was 185,565 metric tons, an increase of 105,000 tons. The greater part of this coal was mined by the Cerro de Pasco Company and was converted into coke for the use of that company.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on April 17: Best Welsh steam, $3.54@3.60; seconds, $3.42; thirds, $3.30; dry coals, $3.48; best Monmouthshire, $3.12; seconds, $3.06; best small steam, $2.46; seconds, $2.16. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, April 28—The iron and steel markets generally show a considerable improvement, as far as the volume of new business is concerned. Activity is gradually developing on several lines and there appears to be a greater confidence in the future.

The large business in structural steel continues. Orders for bridges and buildings come in steadily. Some of these are of large dimensions, but the small orders which naturally predominate make up a very considerable aggregate. A conservative estimate of structural orders for the month of April foots up a total at something over 200,000 tons, this quantity including only orders actually placed. Orders for bars have also been liberal at the low prices recently fixed, while in sheets and plates there has been a fair business. In wire products business has not been active, for the reason that further reductions are expected. An exception is found in nails, on which lower prices have been named at Pittsburg, and for which the demand appears to be very large.

Rail orders from domestic roads have not been much in evidence though several small contracts have been placed. There has been quite a business in rails for export, recent contracts including 6000 tons for Panama, 5000 tons for Brazil and 13,000 tons for Mexico.

In pig iron there has been more business than for a number of weeks past, both in the West and in seaboard territory. New England manufacturers seem to be waking up and are taking both foundry and basic iron for second and third quarters, and the same is the case in New York and New Jersey. Buyers seem to have more confidence in the future and also to have made up their minds that prices are near the bottom and are taking iron accordingly.

United States Steel Corporation—This preliminary statement for the first quarter, issued today, gives net earnings and income as below:

	1908.	1909.
January	$ 5,052,743	$ 7,262,605
February	5,709,428	7,669,336
March	7,469,834	7,989,327
Total for quarter	$18,229,005	$22,921,268
Depreciation and subsidiary co. acco'ts		$ 3,736,199
Interest and sinking fund		7,311,963
Total charges		$11,048,162
Balance		$11,873,106
Dividends declared		8,846,432
Surplus for the quarter		$ 3,026,674

As compared with the December quarter of 1908, the net earnings show a decrease of $3,304,217; the increase over the March quarter of 1908 being $4,692,263. The dividends declared for the quarter were the usual ones, of 1¾ on preferred, and ½ per cent. on common stock. The unfilled orders on the books on March 31 were 3,542,595 tons; which compares with 3,603,527 tons on Dec. 31 and 3,765,343 tons on March 31, 1908. During April, however, there was a large increase in orders.

Birmingham

April 27—The tonnage sold for the month of April in the South has been satisfactory. The Tennessee company, which has been selling iron on a basis of $11 per ton, No. 2 foundry, now quotes $11.50, while others have been getting $11.50 per ton right along. There is a little iron on the furnace yards in this district, but not enough to cause any apprehension.

Officials of the American Radiator Com-

pany, of Chicago, are in Birmingham, completing the deal whereby that concern takes hold of the plant of the Birmingham Pipe and Casting Company.

The sale of the properties of the Southern Steel Company, bankrupt, having been confirmed by the special referee, the reorganization of the company is but a matter of form, and the steps looking to a rehabilitation of the work will soon be in hand.

Foundries and machine shops look for a brighter future also. It is announced that the Payne & Joubert foundry and machine shops in this district will be more than doubled in the next few months, plans now being in hand.

Baltimore

April 26—Exports for the past week included 3,958,200 lb. steel billets to Liverpool. Imports included 10 ingots electric steel from Antwerp; 20 tons spiegeleisen and 746 tons ferromanganese from Liverpool; 4950 tons iron ore from Cuba.

Chicago

April 26—The iron market seems to be strengthening both for pig iron and finished products. Contracts for third- and fourth-quarter deliveries of pig iron are more numerous and Southern interests are trying to hold the price of No. 2 firmly up to $11.50 Birmingham, or $15.85 Chicago. Some sales, however, are undoubtedly made at less. Melters are inclined to increase their purchases for needs of the next three months also, buying with more confidence. Some Southern iron is selling at $12, Birmingham, in small lots. There is no decided turn of the market, but conditions are more encouraging for the seller than in many weeks past. Northern iron remains quiet and steady, with No. 2 selling for $16.50 @17, and local furnaces supplying the demand closely. Lake Superior charcoal remains at $19.50@20.

Iron and steel products are in increasing demand generally, though sales are not notably large in the two very heavy lines, railroad supplies and structural material. Coke is improving in demand, though the best Connellsville remains at $4.70, Chicago.

Cleveland

April 27—Ice still holds at the Sault but it is believed that boats will be able to get through in a few days. Several vessels have started, having no difficulty in getting crews, notwithstanding the orders of the unions. Nothing definite has been settled about iron-ore prices, and the only sales have been a few small ones from dock stocks.

Pig Iron—Buyers seem to have made up their minds that prices are as low as they will go, and there has been a good local business in foundry and basic for second and third quarters. Prices are on a basis of about $15, Cleveland, for No. 2 Northern foundry.

Finished Material—Good sales are reported of structural material, with a fair business in bars and plates.

Philadelphia

April 28—Inquiries for basic iron made a week or so ago have developed into orders, and two or three large sales have been effected on which deliveries will be made in May. In other kinds of iron makers have been obliged to submit to shading in order to effect sales on account of the persistent shading of Southern irons. Quite a number of small buyers in this territory have been in the market within a few days and have bought more liberally than for months. Some consumers are beginning to purchase more material than the work in hand called for. Very little iron is being bought for third-quarter delivery, though business of this character is known. Forge iron continues to drag.

Steel Billets—More steel billets have sold within the week, but delivery is uncertain, the buyers feeling that now is a good time to secure themselves. These sales show a slight reduction from recent quotations.

Bars—Bar iron is quoted at 1.30 for refined and 1.25c. for common, with an unsatisfactory demand. Large consumers are withholding orders or buying small lots.

Pipes and Tubes—Locomotive work is improving steadily. The Pennsylvania Railroad Company has ordered the construction of 44 engines of large capacity. The small-shop demand for tubes is better.

Scrap—The scrap market is dull, although there are more buyers looking around for supplies, but only for present wants. There is more inquiry for cast scrap than for any other kind this week. Railroad scrap is dull and is held for higher figures. The stock is quite large and the dealers feel that there will be no difficulty in unloading it a little later.

Pittsburg

April 27—The improvement in the iron and steel trades which set in about the first of the month has gained additional force, and the whole position of the market is distinctly better. The current bookings are at a greater rate than at any previous time this year and are well ahead of the average of last year. Production is also larger. The Carnegie Steel Company is producing 21,000 tons of steel ingots daily, its full capacity being 28,000 tons. The sharp competition in steel bars, structural shapes and plates has resulted in good bookings.

As a result of this position the Carnegie Steel Company this morning advanced its prices on bars, plates and shapes $1 a ton, and decided not to take business as far ahead as formerly. Its new prices are not absolutely fixed, being flexible as were the old prices. The new prices, for attractive business, are 1.15c. for bars and 1.25c. for plates and shapes, at Pittsburg, prices for Chicago delivery being 15c. per 100 lb. higher. When the break occurred in February bars at once dropped to 1.20c. and plates and shapes to 1.30c. These prices held for a short time, but of late have been shaded very generally, bars being sold regularly by two or three interests at 1.10c., occasionally at slightly less, while shapes and plates sold at 1.20c. and in the case of specially attractive tonnages as low as 1.10c. was done.

There has been sharper competition in wire nails, and 10c. a keg under the official price of $1.95 is being done regularly on attractive orders. Some producers are now comfortably filled up for two months. There has also been sharper competition in small spikes, which have been sold in some cases as low as $1.60 per 100 lb., the old price being $1.80. Standard railroad spikes have been shaded 5c. to $1.65.

Pig Iron—There has been much more active inquiry in the past week, and sales have been larger than at any previous time this year. The Massillon Iron & Steel Company, the independent cast-iron pipe interest at Massillon, O., has bought 20,500 tons of northern foundry iron, for delivery in the second half, paying on the basis of $14, Valley, for No. 2. The International Harvester Company, Allis-Chalmers Company and General Electric Company have bought, following the purchase of 10,000 tons by the Westinghouse Electric & Manufacturing Company. Some good inquiries have appeared from Pittsburg consumers. For prompt delivery foundry and basic iron can be had at $14, Valley, or $14.90, Pittsburg, but for third quarter at least 25c. advance is demanded. Bessemer has been quiet, at $14.75, Valley, for prompt, $15 and upward for second half.

Steel—The market is somewhat firmer. Some mills at a distance from Pittsburg would shade nominal prices, but for Pittsburg delivery billets are firm at $23. Shipments have improved on old contracts.

Sheets—Demand has slightly increased. Prices remain at 2.25c. for black and 3.25c. for galvanized, 28 gage, ordinary carload lots, while on attractive orders a concession of $1 a ton is given.

Ferromanganese—Prices quoted show quite a range, as a few low sellers are making the market, others quoting much higher prices. On ordinary carloads the market is about $42, seaboard, or $43.95, delivered Pittsburg, but on large lots $41, seaboard, could be done.

Metal Markets

New York, April 28—More activity in business is noted in several lines, and there is a measurable degree of improvement.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Mar. 1909..	$21,252,462	$ 5,161,648	Exp. $16,090,814
" 1908..	1,447,206	3,649,407	Imp. 2,202,201
Year 1909..	37,978,632	12,158,275	Exp. 25,820,357
" 1908..	3,859,003	17,296,024	Imp. 13,437,021
Silver:			
Mar. 1909..	5,079,287	3,279,531	Exp. 1,799,756
" 1908..	4,329,369	3,757,027	" 572,342
Year 1909..	14,473,930	10,453,218	" 4,020,712
" 1908..	12,586,287	10,830,656	" 1,755,631

Exports from the port of New York, week ended April 24: Gold, $2,600,250, chiefly to Argentina and Brazil; silver, $729,870, chiefly to London. Imports: Gold, $111,286, from Central and South America; silver, $82,316, from Japan, Australia and Mexico.

Gold—Prices on the open market in London are at the normal point, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American eagles. The Bank of France is again buying gold, but there is no sharp competition. In New York exports continue to Argentina and Brazil; some gold has also been taken for shipment to Paris.

Platinum—Business continues on a fair scale with prices unchanged at $23@24 per oz. for refined platinum, $26 for hard metal and $19@21 for scrap.

Our St. Petersburg correspondent reports under date of April 15 that a fall in prices is to be noted. The larger dealers will not sell at current quotations, as they expect a rise; but there is some metal in the hands of weak holders and this has affected quotations. At Ekaterinburg the nominal price is still 5 rubles per zolotnik, but small holders have sold at 4.60@4.80 rubles—equal to an average of $17.67 per oz. for crude. In St. Petersburg crude metal, 83 per cent., is offered at 18,000@19,000 rubles per pood—average $18.13 per oz. It is expected that these weak holders will soon be sold out.

Silver—Silver has shown some strength this past week, owing to purchases on China account and recovering by speculators of silver sold short at somewhat lower prices. The market closes steady today.

SILVER AND STERLING EXCHANGE

Apr.	22	23	24	26	27	28
New York....	51⅝	52¼	52⅛	52	52⅜	52⅜
London.....	23 1/16	24 1/16	24	23 1/16	24⅛	24⅛
Sterling Ex..	4.8760	4.8750	4.8745	4.8745	4.8735	4.8730

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, reported by Messrs. Pixley & Abell, year to April 15:

	1908.	1909.	Changes.
India.... ...	£ 2,150,538	£1,175,400	D. £ 975,138
China..	506,400	983,200	I. 476,800
Straits.....	90,200	82,800	D. 7,400
Total.....	£ 2,747,138	£2,241,400	D. £ 505,738

Imports for the week, £5000 from Mexico and £295,000 from New York; total, £300,000. Exports, £47,000 to China and £25,000 to India; £72,000 in all.

Copper, Tin, Lead and Zinc

	Copper.			Tin.	Lead.		Zinc.
Apr.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
22	12⅞ @13	12⅝ @12⅞	57	29½	4.20 @4.25	4.10 @4.15	4.92½ @4.95
23	12⅞ @13	12⅝ @12⅞	57⅛	29⅝	4.20 @4.25	4 10 @4.15	4.92½ @4.95
24	12⅞ @13	12⅝ @12⅞	....	29⅝	4.20 @4.25	4.10 @4.15	4.92½ @4.95
26	12⅞ @13	12⅝ @12⅞	57⅝	29½	4.20 @4.25	4.10 @4.15	4.90 @4.95
27	12⅞ @13	12⅝ @12⅞	57⅛	29¼	4.20 @4.25	4.10 @4.15	4.90 @4.92½
28	12⅞ @13	12⅝ @12⅞	57⅛	29¼	4.20 @4 25	4 10 @4.15	4.87½ @4.92½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—During the week April 22-28 the market has remained very quiet. Some transactions of moderate volume have been made with European and domestic consumers. Lake copper was sold at 12⅞c. for good ordinary brands, while some special brands fetched 13c., and Calumet & Hecla is said to have realized a trifle more. Electrolytic copper has been freely offered at 12¾c., delivered, 30 days, equivalent to somewhat less than 12⅝c., cash, New York, even for delivery as late as August, and concessions were made to develop business. At the close the market is unchanged at 12⅞@13c. for Lake copper, and 12½@12⅝c. for electrolytic, in ingots, cakes and wirebars. The average of the week for casting copper has been 12⅜@12½ cents.

Copper sheets are 16½c. base for large lots. Full extras are charged, and higher prices—up to 18c.—for smaller quantities. Copper wire, 14¼c. base, carload lots at mill. Business has been rather light.

The transactions in the London standard market at the beginning of the week were of considerable volume at somewhat higher quotations. The full advance, however, was not maintained, and the market closes steady at £57 7s. 6d. for spot, £58 2s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £62; best selected, £61@62; strong sheets, £73@75.

Exports of copper from New York and Philadelphia for the week, 5823 long tons. Our special correspondence gives the exports from Baltimore at 1988 tons copper.

Tin—The transactions on the London Metal Exchange have been of moderate volume, and the market remains exceedingly dull. This is somewhat surprising in view of the good consumption which is reported from this side. The close is cabled at £132 7s. 6d. for spot, £133 12s. 6d. for three months. In this market tin is offered at the close at 29¼ cents.

Lead—While the demand for this metal has somewhat relaxed, quotations nevertheless remain firm, and close at 4.10@4.15c. St. Louis, 4.20@4.25c. New York.

The London market has shown a hardening tendency and fair transactions are reported. The close is firm at £13 7s. 6d. for Spanish lead, £13 10s. for English lead.

The John Wahl Commission Company reports to us from St. Louis under date of April 28 as follows: Lead dull and trading of only a retail character. Common brands of Missouri lead obtainable at 4.12½c. and lightly salable at that price. Corroding brands of southwest Missouri lead worth 4.17½ cents.

Spelter—The demand for this metal seems to have been taken care of for the present, and the few orders which presented themselves were eagerly competed for. Prices show a declining tendency and close at 4.87½@4.92½c., St. Louis, 5.02½@5.07½c., New York.

No change is to be reported from the other side, and London quotations close steady at £21 12s. 6d. for good ordinaries, £21 17s. 6d. for specials.

New York quotations for spelter, April 22-24, inclusive, 5.07½@5.10c.; 26, 5.05@5.10c.; 27, 5.05@5.07½c.; 28, 5.02½@5.07½ cents.

Base price of sheet zinc is now 6¾c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

The John Wahl Commission Company reports to us from St. Louis under date of April 28 as follows: Spelter is a little lower, spot selling at 4.90c., and metal for May delivery at 4.92½c., East St. Louis.

Other Metals

Antimony—Business has fallen off again, and the market is quiet. Prices are unchanged at 8½c. for Cookson's; 8¼c. for Hallett's; 7⅞@8c. for U. S. and other brands.

Aluminum—No change is to be noted in business or prices. No. 1 ingots, 22@24c. base; wire 31@32c. and sheets 33@34c. base.

Quicksilver—Business is not particularly active. New York quotations are $44.50 per flask of 75 lb. San Francisco, nominal at $44 for domestic orders and $42 for export. London, £8 7s. 6d. per flask, with £8 2s. 6d. named by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, spot, from 50c. for 2000-lb. lots up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotation 75c. per lb., in 100-lb. lots, at Cleveland, Ohio.

Magnesium—Quotations for this metal are $1.25 per lb., New York, in 100-lb. lots; for 5-lb. lots, $1.40 per pound.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, three months ended March 31, figures in long tons, except quicksilver, which is in pounds:

	Imports.	Exports.	Excess.	
Copper	30,191	18,910	Imp.	11,291
Copper, 1908	34,205	16,568	Imp.	17,637
Tin	10,390	10,099	Imp.	391
Tin, 1908	11,374	10,159	Imp.	1,215
Lead	52,905	11,241	Imp.	41,664
Lead, 1908	59,285	14,379	Imp.	44,906
Spelter	27,417	1,564	Imp.	25,853
Spelter, 1908	24,697	1,723	Imp.	22,974
Quicksilver, lb.	893,993	270,196	Imp.	623,797
Quicksilver, '08	878,056	572,880	Imp.	305,176
Ores:				
Tin ore and con.	5,137	.....	Imp.	5,137
Tin ore, 1908	6,684	.....	Imp.	6,684
Pyrites	205,547	.....	Imp.	205,547
Pyrites, 1908	245,182	.....	Imp.	245,182

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Of the imports in 1909 the United States furnished 128 tons copper matte, 4859 tons fine copper and 8393 tons lead.

British Iron Trade—Exports and imports of iron and steel and their products in Great Britain for the three months ended March 31 are valued as below, in long tons:

	Exports.	Imports.	Excess.
Iron and steel	£ 8,914,419	£ 1,854,828	Ex. £ 7,059,591
Machinery	6,761,462	1,151,455	Ex. 5,610,007
New ships	1,499,864	.....	Ex. 1,499,864
Total	£17,175,745	£ 3,006,283	Ex. £14,169,462
Total, 1908	19,953,214	3,128,834	Ex. 16,824,380

Decrease in exports this year, £2,777,469, or 13.9 per cent.; decrease in imports, £122,551, or 3.9 per cent. The quantities of iron and steel were, in long tons:

	1908.	1909.	Changes.
Exports	989,259	931,403	D. 57,856
Imports	246,945	277,877	I. 30,932

The imports this year were largely of blooms, billets and other half-finished material.

British Iron Ore Imports—Imports of iron ore into Great Britain, three months ended March 31, were 1,402,510 long tons in 1908, and 1,363,012 in 1909; a decrease of 39,498 tons. Of the imports this year 1,052,175 tons were from Spain.

Zinc and Lead Ore Markets

Joplin, Mo., April 24—The highest price reported paid was $43, the base price ranging from $38 to $41 per ton of 60 per cent. zinc for sulphide ore, and $17 to $19 per ton of 40 per cent. zinc for silicate ore. The average price, all grades, was $37.36, with a minimum of silicate sales. Lead ore is reported sold as high at $58, 80 per cent. grades bringing $57. The average price, all grades, is $57.08 per ton.

With this week is ended four months of 1909, with an increase of 18,967 tons of zinc and 9769 tons of lead. The zinc value is a gain of $772,433, the lead value a gain of $272,621, and the total value is $1,045,054 greater than the same period of last year. The shipment is an average of 5628 tons per week for each week of this year, against an average of 4514 each week last year.

SHIPMENTS, WEEK ENDED APR. 24

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,041,870	829,380	$102,461
Joplin	1,969,860	250,570	46,474
Miami	509,480	255,910	15,954
Galena	687,650	163,850	15,847
Granby	917,790	10,000	12,747
Duenweg	586,740	53,440	11,701
Prosperity	406,800	121,640	11,397
Alba-Neck	540,000	.....	10,800
Oronogo	589,270	1,780	9,876
Aurora	435,760	3,730	8,255
Carthage	375,840	.....	7,516
Spurgeon	233,030	69,380	5,266
Sarcoxie	299,750	.....	5,028
Badger	74,050	9,890	3,256
Cave Springs	141,640	.....	2,832
Saginaw-Shoalsburg	74,320	51,810	2,830
Zincite-Sherwood	115,780	.....	2,256
Totals	11,999,630	1,761,380	$274,496
Four months	191,417,490	41,388,570	$4,252,754
Four mos. last year	153,483,380	21,849,190	3,207,700
Increase	37,934,110	19,539,380	1,045,054

Zinc value, the week, $224,212; 4 mos, $3,435,548
Lead value, the week, 50,284; 4 mos, 817,206

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	.....	34.08	.....	52.47	.....
May	34.19	.....	33.39	.....	56.05	.....
June	33.06	.....	32.07	.....	60.48	.....
July	34.55	.....	31.67	.....	59.90	.....
August	36.53	.....	33.42	.....	60.34	.....
September	37.63	.....	34.44	.....	54.59	.....
October	35.95	.....	33.28	.....	52.63	.....
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., April 24—The highest price paid for zinc ore was $41; the base price was $39@39.50 per ton of 60 per cent. zinc. For 80 per cent. lead ore, $53 per ton was paid.

SHIPMENTS, WEEK ENDED APR. 24

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Hazel Green	405,400	71,800	.....
Strawbridge	396,000	.....	.....
Platteville	360,000	.....	146,450
Galena	324,000	.....	.....
Days Siding	176,000	.....	.....
Livingston	60,000	.....	.....
Cuba City	50,500	88,700	.....
Total	1,771,400	160,500	146,450
Year to Apr. 24	31,614,924	1,067,960	2,883,100

Highland and Linden are not reported. In addition to the above there was shipped to the American Zinc Ore Separating Company, 135,500 lb. and to the Joplin Separator Works, 225,000 lb. zinc concentrates.

Chemicals

New York, April 28—The market is quiet; most of the current deliveries are on yearly contracts.

Copper Sulphate—Prices remain unchanged at $4.60 per 100 lb. for carload lots and $4.85 per 100 lb. for smaller parcels. Sales have been moderate.

Arsenic—Current quotations for white arsenic are 2⅞@3c. per lb. Sales are improving slightly.

Nitrate of Soda—Current sales continue rather small. Prices remain unchanged at 2.15c. for spot nitrate and 2.12½c. for futures.

Mining Stocks

New York, April 28—The general stock market this week has been a good of a traders' market with many fluctuations, but perhaps no very definite tendency. It continues to show considerable strength, and though fluctuations have been in both directions, there is no apparent tendency to a decline. It must be said that the market seems to ready to absorb all the stocks that were offered. Speculation has been helped by cheap money and also by the apparent disposition of the foreign markets to retain the stocks recently purchased here. The Turkish trouble has affected the London and Paris exchanges very much less than was expected.

On the Curb the copper stocks were a good deal in evidence and prices were fairly well held. Nevada Consolidated continued to be in demand. The one exception was North Butte, which was severely handled both here and on the Boston exchange and showed a sharp decline.

Cobalt stocks were in good demand and at fair prices. The Nevada gold stocks are rather reviving, more interest being taken in them, with consequent better buying.

Boston, April 27—A $14.50 drop per share in the price of North Butte mining stock the past week has proved somewhat disastrous to the market and has undermined public sentiment. The reason for this sharp decline remains a mystery up to the present time. Undoubtedly there has been liquidation of large inside holdings of stock but the last 10 or 20 points on the down side were mainly the result of bear manipulation. From a high at $85.25 made on Jan. 2 of the present year, the price reached $52.50 today, representing a decline of $32.75 or a depreciation of over $13,000,000 in the value of the property. On Monday alone the stock broke

$9.25 per share which is enough to affect loans on the stock. The stock reached $120 per share in 1907 and went as low as $30 during the panic period of that year. A covering movement carried the stock up to $56.50 at the close tonight. The one great criticism is that North Butte has paid out practically all that it has earned.

A bear attack on Copper Range broke the stock to $73.50, which represents a decline of $4.50 for the week. East Butte has suffered to the extent of almost $3, touching $13.25. A selling movement in Butte Coalition carried the price off $1.62½ to $22.50. Mass mining touched $10, but closed off at $8.75 tonight. Activity has been confined to a few stocks but declines have been general.

Amalgamated has been little affected by price movements in this market as its fluctuations have been dominatel by the strength of the New York list.

Boston Stock Exchange members are somewhat upset over the likelihood of the removal of the exchange from State Street to a spot southerly in direction. State Street to Boston is the same as Wall Street is to New York and sentiment may insist upon remaining in the present location. The lease in the present quarters does not expire for two years yet.

Southwestern Development has been the Curb exchange feature. After selling up to $1.06¼ it broke to 17c., rallying subsequently to 35 cents. A bull campaign was spoiled by the slipping of either treasury or pooled stock.

STOCK QUOTATIONS

NEW YORK Apr. 28	
Name of Comp.	Clg.
Alaska Mine	.44
Amalgamated	75⅝
Anaconda	44¾
Balaklala	‡2 1/16
British Col. Cop.	6
Buffalo Mines	3⅜
Butte Coalition	22¾
Colonial Silver	¼
Cum. Ely Mining	7⅝
Davis-Daly	5⅞
Dominion Cop	⅛
Douglas Copper	2⅝
El Rayo	3
Florence	3 7/16
Foster Cobalt	.34
Furnace Creek	.10
Giroux	7⅛
Gold Hill	⅛
Goldfield Con	8 7/16
Granby	96
Greene Gold	¼
Greene G. & S.	7
Guanajuato	1⅛
Guggen. Exp.	179½
Hanapah	15
Kerr Lake	7 9/16
McKinley Dar.	.94
Miami Copper	15
Micmac	⅛
Mines Co. of Am.	⅛
Mitchell Mining	⅛
Mont. Sho. C.	1 3/16
Nev. Utah M. & S.	2 1/16
Newhouse M. & S.	2⅛
Nipissing Mines	10⅛
Old Hundred	⅜
Silver Queen	.46
Stewart	⅛
Tennessee Cop'r.	40¾
Tri-Bullion	1/16
Union Copper	1
Utah Apex	6¼
Utah Copper	47¼
Yukon Gold	4 3/16

BOSTON Apr. 28	
Name of Comp.	Clg.
Adventure	8
Allouez	38
Am. Zinc	‡25¼
Arcadian	37⅛
Arizona Com	41
Atlantic	10⅝
Boston Con	12⅛
Calumet & Ariz	97½
Calumet & Hecla	600
Centennial	‡30¼
Copper Range	74½
Daly-West	10
East Butte	13¾
Franklin	14¾
Greene—Can	10
Hancock	‡10¾
Isle Royal	22¼
Keweenaw	3
La Salle	13½
Mass	9¾
Michigan	12⅛
Mohawk	59
Nevada	20¾
North Butte	56½
Ojibway	11¼
Old Colony	‡48
Old Dominion	50¾
Osceola	124
Parrot	31
Quincy	88
Rhode Island	‡4¾
Shannon	13½
Superior	39½
Superior & Bost	15
Superior & Pitts	13
Tamarack	66
Trinity	13⅛
U. S. Smg. & Ref.	44
U.S. Sm. & Re., pd.	46⅛
Utah Con	39⅛
Victoria	4¾
Winona	4¾
Wolverine	142
Wyandotte	2⅛

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem	‡38¼
Am. Smelt. & Ref.	88¾
Am.Sm. & Ref., pf.	105⅝
Colo. Fuel & Iron	37⅝
Federal M. & S.,pf.	‡82
National Lead	87¾
National Lead, pf.	104
Pittsburg Coal	11
Republic I. & S.	23⅞
Republic I. & S.,pf.	77½
Sloss-Sheffield	‡76
Standard Oil	668
U. S. Steel	53⅜
U. S. Steel, pf.	115
Va. Car. Chem.	46⅝

BOSTON CURB	
	Low.
Ahmeek	160
Black Mt.	1 1/16
Chemung	17
Globe Con	4
Helvetia	2⅝
North Lake	‡7⅛
Ray Central	2 13/16
Ray Con	14
San Antonio	10⅛

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Apr. 24		
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.08	.05
Center Cr'k	1.80	1.50
Cent. C. & C.	81.00	80.00
C.C. & C. pd.	80.00	79.00
Cent. Oil	110.00	100.00
Columbia	8.00	5.00
Con. Coal	20.00	19.00
Doe Run	110.00	100.00
Gra. Bimet.	.25	.18
St. Joe	12.00	11.00

LONDON Apr. 28			
Name of Com.	Clg.		
Dolores	£1	5s	0d
Stratton'sInd.	0	3	1½
Camp Bird	1	3	3
Esperanza	2	16	3
Tomboy	1	2	6
El Oro	1	4	9
Oroville	0	11	3

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Apr. 28.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.18
Belcher	.44	St. Ives	.13
Best & Belcher	.39	Triangle	.02
Caledonia	.11	BULLFROG STOCKS	
Challar	.07	Gibraltar	.04
Comstock	.23	Homestake King	.02
Con. Cal. & Va	.61	Mont. Shoshone C.	1.75
Crown Point	.50	Tramp Cons	.07
Exchequer	.19	MISCELLANEOUS	
Gould & Curry	.09	Bonnie Clare	...
Hale & Norcross	.18	Lee Gold Grotto	...
Mexican	.76	Nevada Hills	1.18½
Ophir	1.17	Nevada Smelting	.87½
Overman	.12	Nevada Wonder	.70
Potosi	.12	Nevada-Utah	2.68¾
Savage	.19	Penn-Wyoming	.02
Sierra Nevada	.17	Pittsburgh S. Pk.	.61
Union	.32	Rawhide Caol't'n.	...
Utah	.01	Round Mt. Sphinx	.15
Yellow Jacket	.62		
TONOPAH STOCKS			
Belmont	1.03		
Extension	.50		
Golden Anchor	...		
Jim Butler	.17		
MacNamara	.30		
Midway	.28		
Montana	.82		
North Star	.03		
Tono'h Mine of N.	7.00		
West End Con	.35		
GOLDFI'D STOCKS			
Adams	.02		
Atlanta	.15		
Blue Bell	.04		
Booth	.20		
Columbia Mt.	.14		
Comb. Frac	1.06		
Con. Red Top	.07		
Cracker Jack	.04		
Dia'dfield B. B. C.	.06		
Goldfield Belmont	.04		
Goldfield Daisy	.40		
Great Bend	.15		
Jumbo Extension	.16		
Kendall	.06		
Lone Star	.06		
May Queen	.04		
Oro	.10½		
Red Hill	.11		
Roanoke	...		
Sandstorm	.13		

COLO. SPRINGS Apr. 23	
Name of Comp.	Clg.
Acacia	‡.06⅛
Black Bell	....
C. C. Con	.03
Dante	.06⅛
Doctor	.09
Elkton	.64
El Paso	.45¾
Findlay	.14¾
Gold Dollar	.10
Gold Sovereign	‡.03
Isabella	.20⅝
Jack Pot	.06¾
Jennie Sample	.07⅞
Jerry Johnson	.05¾
Mary McKinney	.37
Pharmacist	.03
Portland	.87
Un. Gold Mines	.05¾
Vindicator	.62
Work	‡.07

Assessments

Company.	Delinq.	Sale.	Amt.
Blackjack Con., Utah	Apr. 15	May 7	$0.01
Blue Wing, Ida	May 8	June 5	0.005
Carney Copper, Ida	Mar. 25	May 1	0.003
Crown Point, Nev	Apr. 18	Apr. 28	0.10
Echo, Ida	May 1	June 1	0.002
Elk M. & M., Ida	Apr. 20	May 20	0.001
Exchequer, Nev	May 5	May 26	0.05
Helvetia	May 15	.....	0.50
Imlay, Nev	Apr. 6	Apr. 28	0.03
Laclede, Ida	Apr. 7	May 1	0.003
Mexican, Nev	Apr. 8	Apr. 29	0.10
Nev. Superior	Apr. 10	May 1	0.07½
N. Y. Bonanza, Utah	Apr. 7	Apr. 28	0.03
Reindeer C. & G., Ida	Apr. 28	May 28	0.005
Rexall S. & C., Utah	Mar. 26	Apr. 25	0.01½
Savage, Nev	Apr. 8	May 5	0.10
Sierra Nevada, Nev	May 4	May 25	0.10
Union Con., Nev	Apr. 8	Apr. 30	0.10
Utah, Nev	May 6	May 27	0.03
Yerington Gold, Nev	Apr. 8	May 12	0.005

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.884
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	54.506	.....	25.133	.....
May	52.795	.....	24.377	.....
June	53.663	.....	24.760	.....
July	53.115	.....	24.514	.....
August	51.683	.....	23.858	.....
September	51.720	.....	23.877	.....
October	51.431	.....	23.725	.....
November	49.647	.....	22.933	.....
December	48.769	.....	22.493	.....
Year	52.864	.....	24.402	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.197
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	.....	12.928	.....	58.331	.....
May	12.598	.....	12.788	.....	57.387	.....
June	12.675	.....	12.877	.....	57.842	.....
July	12.702	.....	12.933	.....	57.989	.....
August	13.462	.....	13.639	.....	60.500	.....
September	13.388	.....	13.600	.....	60.338	.....
October	13.354	.....	13.646	.....	60.139	.....
November	14.130	.....	14.386	.....	63.417	.....
December	14.111	.....	14.411	.....	62.943	.....
Year	13.208	.....	13.424	.....	59.902	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	.....
February	28.978	28.290	August	29.942	.....
March	30.577	28.727	September	28.815	.....
April	31.702	.....	October	29.444	.....
May	30.015	.....	November	30.348	.....
June	28.024	.....	December	29.154	.....
			Av. year	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	
January	3.691	4.175	.....	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	.....	.....	13.469	.....
May	4.253	.....	.....	12.938	.....
June	4.466	.....	.....	12.600	.....
July	4.447	.....	.....	13.000	.....
August	4.580	.....	.....	13.375	.....
September	4.515	.....	.....	13.125	.....
October	4.351	.....	.....	13.375	.....
November	4.330	.....	.....	13.538	.....
December	4.213	.....	.....	13.156	.....
Year	4.200	.....	.....	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	.....	4.495	.....	21.344	.....
May	4.608	.....	4.458	.....	19.906	.....
June	4.543	.....	4.393	.....	19.000	.....
July	4.485	.....	4.338	.....	19.031	.....
August	4.702	.....	4.556	.....	19.350	.....
September	4.769	.....	4.619	.....	19.563	.....
October	4.801	.....	4.651	.....	19.750	.....
November	5.059	.....	4.909	.....	20.875	.....
December	5.137	.....	4.987	.....	20.625	.....
Year	4.726	.....	4.578	.....	20.163	.....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

THE MINING INDEX

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

We will undertake to furnish a copy of any article (if in print) in the original language, for the price quoted. Where no price is quoted the cost is unknown. These papers are not kept in stock, but must be ordered from the publisher; hence there will be some delay for foreign papers.

No accounts can be opened for these small amounts, but remittance must be sent with order. For the convenience of those making small but frequent remittances, coupons are furnished at the following prices: 20 cents each, six for $1.00, thirty-three for $5.00 and one hundred for $15.00. This arrangement will be especially appreciated by foreign readers and men in distant mining camps. Where remittances are made in even dollars we will return the excess over an order in coupons upon request.

ALUMINUM.

9117—ALUMINUM FROM CLAY, ETC.—Ueber Verwendbarkeit von Tonerdesilikaten zur Aluminiumfabrikation. Max Moldenhauer. (Metallurgie, Jan. 8, 1909; 7½ pp.)
Results of experiments, including description of apparatus and methods, on the extraction of aluminum from silicates of the metal. 40c.

9118—WELDING—Autogenous Welding of Aluminum. M. U. Schoop. (Electrochem. and Met. Ind., April, 1909; 2 pp.)
Describes the requirements necessary for a thoroughly practical application of this method. Illustrated. 40c.

ASPHALTUM.

9119 — FRANCE—Geological Occurrence and Mining of Asphalt in France. S. A. Ionides. (Min. Sci., April 1, 1909; 2 pp.)
A description of the methods used in mining, together with the uses of asphalt. Illustrated. 20c.

CALCIUM CARBIDE.

9120—MANUFACTURE of Calcium Carbide. (Engineering, March 26, 1909; 3½ pp.)
The author describes the calcium carbide factory at Odda, Norway, and gives a detailed account of the electric power plant which develops 23,000 electrical horse-power. To be continued. 40c.

CARBORUNDUM.

9121—MANUFACTURE of Modern Grinding Wheels. (Am. Machinist, Apr. 1, 1909; 4 pp.)
An outline of the process by which carborundum is made, and how it passes from crystals into complete grinding wheels. Also some notes on testing. Illustrated. 20c.

CEMENT.

9122—PORTLAND CEMENT for Use in the Tropics. R. K. Meade. (Eng. News, April 8, 1909; 3 pp.)
The author gives analyses and descriptions of a number of representative American cements. Also some notes on the use of American cement in Central and South America and the Philippines. 20c.

9123—PORTLAND CEMENT—The Manufacture of Portland Cement. W. M. Kinney. (Proc. Eng. Soc. Western Penn., March, 1909; 32 pp.)
The author gives an historical review of the cement industry with descriptions of the principal processes and machinery that are employed today in the cement industry. Illustrated. 40c.

COAL AND COKE.

9124—CANADA—The Mining Operations of the Dominion Coal Company. F. W. Gray. (Can. Min. Journ., Mar. 15, 1909; 5½ pp.)
This instalment describes the Emery seam and the lower seams of the Glace Bay basin. Map and illustrations. 20c.

9125—COAL SAMPLING and Analysis. N. W. Lord. (Eng. News, April 8, 1909; 1 p.)
Some notes on the benefits derived from the analysis of fuel coal. Also a description of some of the laboratory methods. 20c.

9126—COKE—Etude sur la Fabrication du Coke la récolte et le traitement des sous produits de la distillation de la houille. A. Say. (Bull. Soc. de l'Ind. Minérale, Mar., 1909; 39 pp.) Continuation of article previously indexed.

9127—COKE—Washed Coal for Coke Making. Walter J. May. (Pract. Engr., Mar. 12, 1909; 1 p.)
Discusses the utility for washed coal in the coke industry describing briefly a method of operation. 20c.

9128 — COKE-OVEN CONSTRUCTION — Progress in By-Product Coke-Oven Construction at Indianapolis. C. G. Atwater. (Prog. Age, Mar. 15, 1909; 2½ pp.)
An illustrated article describing the work onthe plant of Citizens' Gas Company at Indianapolis, Ind. 40c.

9129—COKE-OVENS—The Base Contained in the Tar from Otto-Hilgenstock Coke-Ovens. F. G. Trobridge. (Journ. Soc. Chem. Ind., Mar. 15, 1909; 2 pp.)
A chemical discussion of the conditions of distillation in retort coke-ovens as compared to those in gas retorts.

9130—COKING PLANT at the Midland Coal, Coke and Iron Company, Ltd., Apedale, Staffs. (Iron and Coal Tr. Rev., Mar. 19, 1909; 1¾ pp.)
A general description of the Midland Coal, Coke & Iron Co.'s Plant, at Apedale, which is equipped with ovens manufactured by Messrs. Simons-Carves of Manchester. Illustrated. 40c.

9131—COLLIERY EQUIPMENT—Bentley Colliery. (Iron and Coal Tr. Rev., Mar. 12, 1909; 1½ pp.)
A description dealing in particular with the mechanical equipment of the plant, with illustrations and plans. 40c.

9132—COLLIERY EQUIPMENT—Gas and Electric Plants at Collieries. (Iron and Coal Tr. Rev., Mar. 5, 1909; 1½ pp.)
This paper read before Nat. Assn. Coll. Mgrs. deals largely with the electric power generation and coking plants at the Powell Duffryn colliery, and a number of other important plants. 40c.

9133—CONVEYING—A New Departure in the Hauling of Coal at the Working Face. (Iron and Coal Tr. Rev., Mar. 12, 1909; 1⅛ pp.)
Describes conveying appliances to be placed in front of the working face and shows how they favor the rapid and economic handling of the coal. Plans. 40c.

9134—DIAMOND DRILLING—The Cost of Diamond Drilling for Coal in Pennsylvania. E. E. White. (Eng. and Min. Journ., Mar. 27, 1909; 1 p.)
Tables are given showing the cost per foot, the kind of rock and the actual rate at which the boring was accomplished. 20c.

9135—EXPLOSIONS—Remarks on Some Recent Explosions in Coal Mines. C. J. Coll. (Journ. Min. Soc. of Nova Scotia, Vol. XIII, 1908; 17 pp.)
The author gives notes on some of the recent coal mine explosions, together with remarks on explosives, open lights, electric mining machinery, coal dust, fire damp, and suggestions for the prevention of coal mine explosions.

9136—EXPLOSIONS—Report of the Glencoe Colliery Inquiry Commission. (Natal Govt. Gazette, Dec. 22, 1908; 20 pp.)
Gives the results of the investigation made by the Government commissioners of Natal with particular reference to the causes of and responsibilities for the explosions, and an outline of the precautions to be taken in similar cases. 60c.

9137—EXPLOSIONS—The Work of the Foreign Mining Explosion Stations. Geo. S. Rice. (Black Diamond, April 3, 1909; 3 pp.)
The author discusses certain experiments which have been performed to determine the action of explosives and to ascertain under what conditions coal dust is most dangerous in a mine. Illustrated. 20c.

9138—MACHINE MINING—Mining Coal with Machines in England. George R. Dixon, (Eng. and Min. Journ., Apr. 17, 1909; 3⅔ pp.)
The author discusses the use of coal mining machinery, the quantity of coal produced, and a comparison of costs with hand labor. Illustrated. 20c.

9139—MINING METHODS — Pocahontas Region Mining Methods. H. H. Stoek. (Mines and Minerals, Apr., 1909; 6½ pp.)
A short geological description of the district, together with methods recommended for developing the mines. Also gives the names of the land holding companies which are operating mines in this section of the State. Illustrated. 20c.

9140—MINING METHODS — The Best Methods of Working Seams of Coal in Steep Measures. H. A. Staples. (Coll. Guardian, Mar. 19, 1909; 1⅓ pp.)
A close study of the economic phase of the question. Describes and illustrates by line drawings the various methods. To be continued. 40c.

9141—MONTANA—Geology of the Great Falls Coal Field, Montana. Cassius A. Fisher. (U. S. Geol. Surv., Bull. No. 356, 1909; 85 pp.)
A report, fully illustrated with maps, geological sections and photographs describing the rock formations; indicating their character, distribution, structure and stratigraphic relations and also embodying a brief statement of mineral resources other than coal.

9142—NEW MEXICO—Report of the Mine Inspector for the Territory of New Mexico to the Secretary of the Interior for the Fiscal Year Ended June 30, 1908. J. E. Sheridan. (Washington, 1908: Government Printing Office; 48 pp.)
A detailed report with statistics on the coal mining industry of New Mexico.

9143—NEW ZEALAND—Methods of Mining Coal in New Zealand. Sidney Fry. (Eng. and Min. Journ., Apr. 10, 1909; 3 pp.)
Gives some notes on the location, and geology of the district, together with detailed description of the Westport-Stockton colliery in which the equipment is similar to that used in the United States. Illustrated. 20c.

9144—PEAT RESOURCES of the United States. Charles A. Davis. (Eng. Mag., April, 1909; 10 pp.)
Treats of the economics of the use of peat as a fuel. 40c.

9145—PHILIPPINE COALS as Fuel. Alvin J. Cox. (Philippine Journ. Sci., Nov., 1908; 53 pp.)
Results of a thorough practical investigation of the steam-making capacity of Philippine coals. Illustrated with 13 plates. 40c.

9146—RESCUE WORK—Recent Advances in Means of Saving Life in Coal Mines. Henry Cunynghame. (Paper before Royal Inst. of Great Britain, Feb. 19, 1909; 16 pp.)
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A description of the method of sinking a shaft through a considerable thickness of

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9148—SHAFT SINKING Operations at Wellesley New Fitting, Wemyss Collieries. G. D. Budge and P. Dunsire. (Trans. Min. Inst. of Scotland, Dec. 10, 1908; 7 pp.)
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Describes rotating and stationary electrodes and outlines methods of analysis. Illustrated.

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Describes a process by means of which these three metals can be volumetrically determined in the presence of each other.

9358—CRUCIBLE—The Munroe Crucible. Walter O. Snelling. (Journ. Am. Chem. Soc., Apr., 1909; 5 pp.)
A description of this platinum crucible, method of preparation and general notes on the use. 80c.

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9364—VANADIC AND ARSENIC ACIDS—The Estimation of Vanadic and Arsenic Acids and of Vanadic and Antimonic Acids, in the Presence of One Another. Graham Edgar. (Am. Journ. Sci., Apr., 1909; 3 pp.)
Notes on the use of a process of differential reduction to determine these elements in the presence of one another. 60c.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—		
Borts, good drill quality, carat.		$85.00
Carborundum, f.o.b. Niagara Falls, powd.	lb.	.08
Grains	"	.10@.17
Corundum	"	.07@.10
Crushed Steel, f.o.b. Pittsburg	"	.05½@.06
Emery, in kegs; Turkish flour	"	.01½@.02
Grains	"	.03½@.04
Naxos flour	"	.01½@.02
Grains	"	.03½@.04
Chester flour	"	.01½@.02
Grains	"	.03½@.04
Peekskill, f.o.b. Easton, Pa., flour	"	.01½@.01⅝
Grains, in kegs	"	.02½@.03
Garnet, per quality	sh. ton.	25.00@35.00
Pumice Stone, Am. Powd., 100 lb.		1.60@2.00
Italian, powdered	per lb.	.01½@.01⅝
Lump, per quality	"	.05@.30
Rottenstone, ground	"	.02½@.04
Lump, per quality	"	.05@.30
Rouge, per quality	"	.05@.30
Steel Emery, f.o.b. Pittsburg	"	.07½@.07⅝
ACIDS—		
Acetic 28%	lb.	.02⅝ up
Boric	"	.07
Hydrofluoric, 30%	"	.02½@.03½
" 48%	"	.06
" 60%	"	.10
Hydrochloric acid, 20°, per lb.		1.25@1.50
Nitric acid, 38°	per lb.	.04@.04½
Sulphuric acid, 50°, bulk per ton.		$12 up
60°, 100 lb. in carboys.		.85@1.12½
60°, bulk, ton		16.00@18.00
66°, 100 lb. in carboys.		1.00@1.10
66°, bulk, ton		18.00
Oxalic	per lb.	.06½@.07
ALCOHOL— Grain 95%	gal.	2.59
Denatured	"	.45@.47
Refined wood, 95@97%	"	.50@.55
ALUM— Lump	100 lb.	$1.75
Ground	"	1.85
Chrome Alum	"	.03¾@.05
ALUMINUM— Sulphate, com'l.	lb.	1.50@1.75
AMMONIA— 24 deg. lb.	"	.04½@.05½
" 26 deg. lb	"	.04¾@.05¾
AMMONIUM—		
Bromide	lb.	.28
Carbonate	"	.07½@.09½
Muriate grain	"	.05⅝@.06½
Lump	"	.09½@.09½
Sulphate, 100 lb.		3.00@3.05
Sulphocyanide com	"	.30
" " chem. pure	"	.40
ANTIMONY— needle, lump	"	.03⅝@.04
ARSENIC— White	"	.02¾@.02⅞
Red	"	.07½@.08
ASPHALTUM—		
Barbadoes	per ton.	40.00@80.00
West Indies	"	20.00@60.00
Egyptian	lb.	.09@.10
Gilsonite, Utah ordinary	per ton.	32.00
Trinidad	"	20.00@25.00
California	"	22.00@28.00
BARIUM—		
Carb. Lump, 80@90%	lg. ton.	30.00@35.00
Precipitated 96@98%		36.00@40.00
Powdered, 80@90%	lb.	.02@.02½
Chloride com'l	ton.	37.00@39.00
Nitrate powdered, in casks	lb.	.05½@.06½
Blanc Fixe, dry	per lb.	.02½@.02¾
BARYTES—		
Am. Ground	sh. ton.	12.00@17.00
Floated	"	17.00@20.00
Foreign floated	"	20.00@22.50
BISMUTH— Sub-nitrate	lb.	1.40@1.45
BLEACHING POWDER— 35%, 100 lb.		1.25@1.50
BLUE VITRIOL— copper sulphate), carload, per 100 lb.		4.40@4.85
BONE ASH	lb.	.02½@.04
BORAX, sacks	"	.04½@.05
CALCIUM— Acetate, gray, 100 lb		1.75@1.80
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J.	sh. ton.	65.00
Chloride, f.o.b. N. Y.	"	11.00@14.00
CEMENT—		
Portland, Am. 500 lb	bbl.	1.50@1.60
Foreign	"	2.25@2.90
"Rosendale," 300 lb.	"	.85
(in sacks)	"	.65
Slag cement	"	.75@1.25
CHROME ORE—		
New Caledonia 50% ex. ship N. Y.	per lg. ton.	17.50@20.00
Bricks, f.o.b. Pittsburg, per M.		175.00
CLAY, CHINA— Am. common ex-dock, N. Y.	sh. ton.	7.00@10.00
Foreign	"	10.00@17.50
COBALT— Oxide	lb.	1.10@1.50
COPPERAS— Bulk	100 lb.	$0.55
In bbls	"	.65@.75
In bags	"	.60@.70
CRYOLITE	lb.	.06½@.06¾
FELDSPAR— Ground	sh. ton.	6.00@12.00
FIRE BRICK—		
American	per M.	30.00@40.00
Imported	"	30.00@45.00
St. Louis	"	18.00
" No. 2	"	15.00
Extra	"	20.00@23.00
FIRE CLAY— f.o.b. St. Louis.		
St. Louis, extra quality	per ton.	5.00
" ordinary	"	2.50
Domestic f.o.b. shipping port:		
FLUORSPAR—		
Domestic f.o.b. shipping port:		
Lump	lg. ton.	8.00@10.00
Ground	"	12.00@14.00
Foreign crude ex. dock		8.00@10.00
FULLER'S EARTH— Lump, 100	lb.	.80@.85
Powdered	"	.80@.85
GRAPHITE— Ceylon.		
Flying dust, finest to best	lb.	.02½@.04
Dust	"	.02½@.05
Chip	"	.04@.08
Lump	"	.05½@.12
Largel ump	"	.08½@.10½
GYPSUM—		
Fertilizer	sh. ton.	5.00
Ground	"	4.00@7.00
INFUSORIAL EARTH—		
Ground Am. Best	lb.	.01½@.02½
German	lb.	.02½@.02¾
LEAD— Acetate (sugar of) brown.	lb.	.07¾@.08
Nitrate, com'l	"	.07⅞@.08¼
MAGNESITE— Greece.		
Crude (95%)	lg. ton.	7.50@8.50
Calcined, powdered	sh. ton.	30.00@35.00
Bricks, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	100 lb.	.90@1.25
Sulphate (Epsom salt)	100 lb.	
foreign		.90@1.00
MANGANESE—		
Foreign, crude, powdered:		
70@75% binoxide	lb.	.01@.01¼
75@85% binoxide	"	.01¼@.01½
85@90% binoxide	"	.01½@.05
90@95% binoxide	"	.06½
Ore, 80%-85%	sh. ton.	16.00@32.50
MARBLE— Flour	sh. ton.	5.00@8.50
MINERAL WOOL—		
Slag, ordinary	sh. ton.	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
MONAZITE SAND—		
Guar. 97%, with 5% Thorium oxide, nominal	lb.	.08 and up
NICKEL—		
Oxide, crude, lb. (77%) for fine metal contained		.47
Sulphate, single	lb.	.09@.11
Sulphate, double	"	.06½@.08
NITRATE OF SODA— 100 lb. 95% for '08		2.15
95% for 1909		2.15
95% for 1910		2.15
96% is 2½@7½c. higher per 100 lb.		
OZOKERITE— best	lb.	.14@.17
PAINTS AND COLORS—		
Litharge, Am. powdered	lb.	.05½@.06½
English glassmakers'	"	.08½@.08½
Lithopone	"	.03½@.07
Metallic, brown	sh. ton.	16.50@22.00
Red	"	14.00@18.00
Ocher, Am. common	"	8.50@9.00
Best	"	16.00
Dutch, washed	lb.	.02½@.03
French, washed	"	.01½@.02
Paris green, pure, bulk	"	.21½
Red lead, American	"	.06@.06½
Foreign	"	.08½@.08½
Turpentine, spirits bbl., per gal.		.40½@.41
White lead, Am., dry	lb.	.05½@.05⅔
American, in oil	"	.06½@.07
Foreign, in oil	"	.10½@.10¾
Zinc white, Am. extra dry	"	.05½@.05⅔
French, red seal, dry	"	.06¾@.07
French, Green seal, dry	"	.07½@.07½
PHOSPHATES— Acid	57@60c. per unit	
*Fla., hard rock		8.50@9.00
land pebble 68%		3.75@4.00
†Tenn., 78@80%		5.00@5.50
75%		4.75@5.00
68@72%		4.25@4.50
‡So. Car. dried rock		7.00@7.25
" " undried rock		5.50@5.75
POTASSIUM—		
Bicarbonate crystal	lb.	$.08½@.09
Powdered or granulated	"	.08½@.08¾
Bicromate, Am.	"	.08¾@.08¾
Scotch	"	.10½
Bromide	"	.20
Carbonate (80@85%)	"	.03½@.04
Caustic, ordinary	"	.05¾@.06½
Elect. (90%)	"	.05½@.06
Chloride (muriate), 100 lb.		1.90
Chlorate, powdered	"	.09½@.09¾
Crystals	"	.09@.09½
Cyanide (98@99%)		
Carloads (30,000 lb.)	"	18c.
5-ton lots		18½c.
Less than 5 tons		.20@.22½
Kainite, long ton, bulk, 8.50; bags, 9.50.		
Permanganate	lb.	.09½@.10½
Prussiate, yellow	"	.13@.13¾
Red	"	.30@.33
Sulphate (basis 90%)	100 lb.	2.18@2.21
PYRITE—		
Domestic, non-arsenical, furnace size, f.o.b. mines	per unit.	11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines		10@10½c.
Imported, non-arsenical, furnace size, per unit		.12@.12½
Imported, arsenical, furnace size, per unit		.11½@.12
Imported fines, arsenical, per unit.		.09
Imported fines, non-arsenical, per unit		10½@11c.
Pyrite prices are per unit of sulphur. An allowance of 25c. per ton is made when delivered in lump form.		
SALT— N. Y. com. fine 280 lb. bbl.		.72@1.13
N. Y. agricultural	sh. ton.	3.80@4.50
SALTPETER— Crude	100 lb.	4.00@4.50
Refined, crystals	"	5.50@6.00
SILICA—		
Ground quartz, ord'ry.	lg. ton.	10.00@15.00
Silex, ground	"	13.00@15.00
Silex, floated	"	35.00@40.00
Lump quartz	"	5.00@5.50
Glass sand	"	2.75
SILVER— Nitrate, crystals	oz.	.33½@.36¾
SODIUM—		
Acetate	lb.	.04½@.05
"Alkali," per 100 lb., 58/48		.80@.87½
Bicarb. soda, per 100 lb		1.00@1.30c.
Soda, caustic, per 100 lb., 78/60		1.90@2.00
Soda, caustic, powdered		.02¾@.03½
Salt cake, per 100 lb., bulk		.45 up
Salt cake, bbl		.65@.85
Soda, monohydrate, per lb.		1.40@1.75
Bicromate	lb.	.06½@.06¾
Bromide	"	.20
Chlorate, com'l	"	.08½@.09½
Cyanide ("100% KCN")		
Carloads (30,000 lb.)	"	18c.
5-ton lots	"	18½c.
Less than 5 tons	"	19c.
Hyposulphite, Am.	"	1.30@1.50
German	"	1.60@1.70
Phosphate	100 lb.	2.20@2.50
Prussiate	"	.08½@.09
Sal soda, f.o.b. N. Y.	"	.65@.75
Foreign, f.o.b. N. Y.	"	.80@1.00
Silicate, com'l	"	.65@1.50
Sulphate, com'l (Glauber's salt)	100 lb.	.65@.80
Sulphate, com'l, calcined		.65@.85
STRONTIUM— Nitrate	lb.	.07½@.08
SULPHUR—		
Louisiana (prime) to New York,	lg. ton.	22.00 up
To Boston, Philadelphia or Baltimore	"	22.50 up
Roll	100 lb.	1.85@2.15
Flour	"	2.00@2.40
Flowers, sublimed	"	2.20@2.60
TERRA ALBA— French & Eng.	100 lb.	.80@1.00
TALC— Domestic	sh. ton.	15.00@20.00
French	"	15.00@25.00
Italian, best	"	30.00@40.00
TIN— Bi-chloride, 50%	lb.	.09½
Crystals	"	.21@.24½
Oxide, lb.	"	.32½@.35
URANIUM— Oxide	"	3.50
ZINC—		
Chloride solution, com'l 20°	"	.02½
Chloride, granular	"	.05@.06
Dust	"	.05@.05½
Sulphate	"	.02½@.03

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

NOTE—These questions are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations fully represent the latter. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their outputs as matters of private contract.